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WORK

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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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Fig. 2.—Tile produced with Brush.

Fig. 3.—Tile produced by Stencil.

Fig. 4.—Tile produced by Combing.

Fig. 5.—Tile produced with Brush. All of the Tiles represented above are Varnished and Coloured.

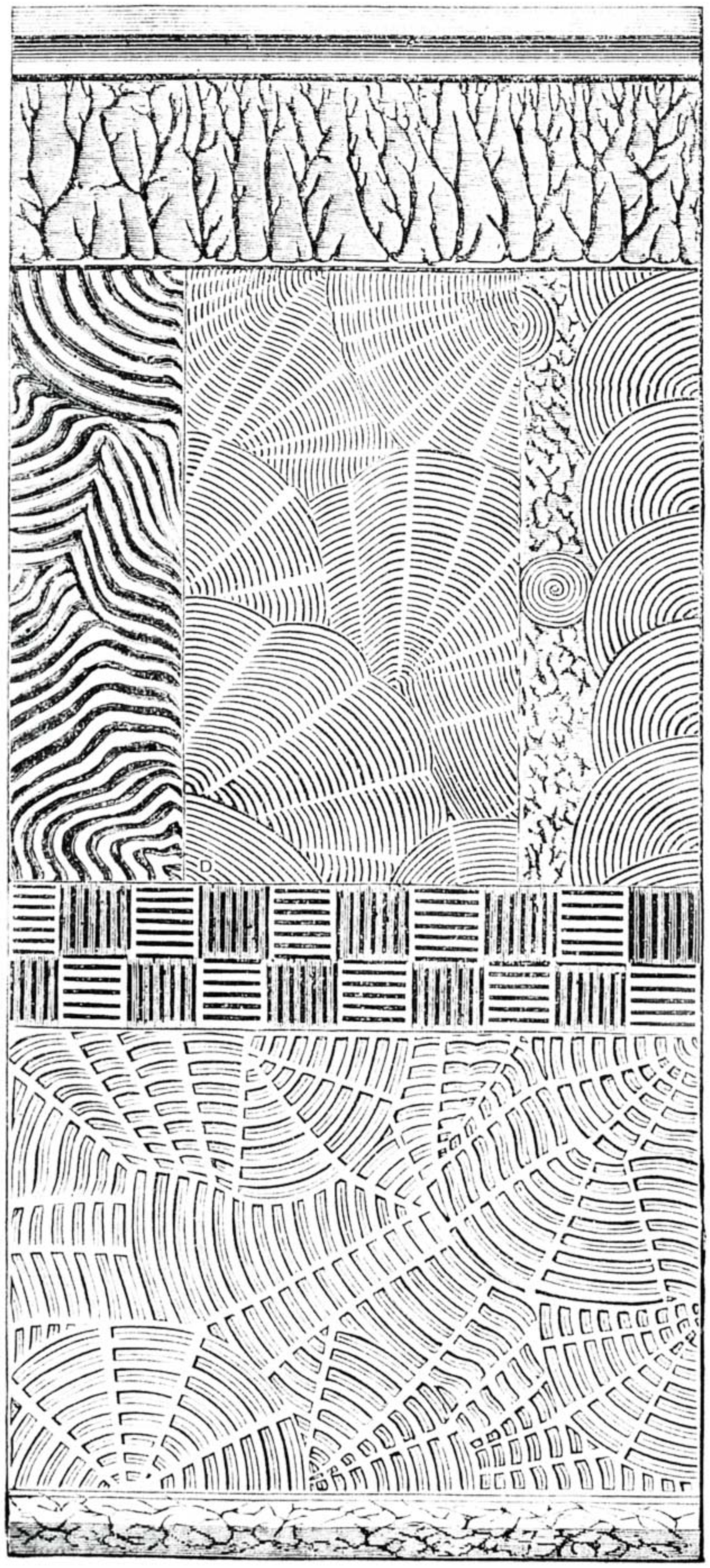

Fig. 1.—Various Styles of Manipulation of Church's Wall Decorator—A, Arboresque Pattern, produced by Suction; B, C, Combed Styles; D, D, Combed Panels; E, Basket-work; F, Graduated Skirting.

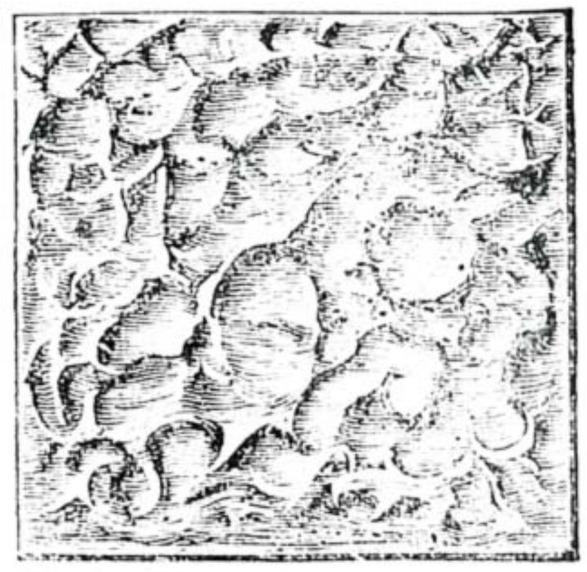

Fig. 6.—Tile produced by Stippling.

Fig. 7.—Tile produced with Brush.

Fig. 8.—Tile produced by Modelling.

Fig. 9.—Tile produced with Brush. All of the Tiles represented above are Varnished and Coloured.

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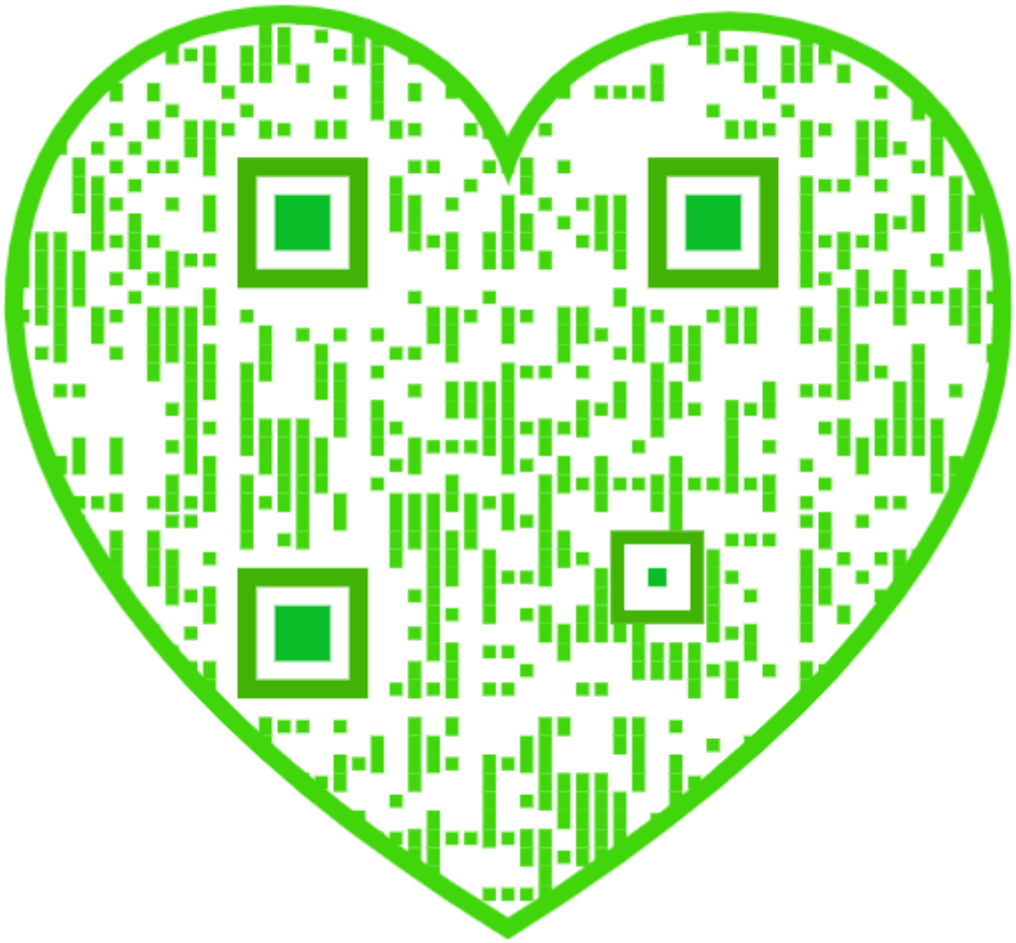

THE WALL DECORATION OF THE FUTURE.

BY H. A.

How to make the house beautiful and keep it so, at a cost moderate enough to suit the purses of nearly every householder, and, at the same time, *not* abrogate the recognised laws of sanitation, has been a problem awaiting solution, and forcing itself more and more to the front of domestic considerations, commensurately with every advance in the standard of comfort of all people of civilised countries.

In this age of marvellous productive energy, artistic skill, stimulated by the presence of countless ever-increasing labour-saving devices, is perpetually bringing before us something both new and beautiful to add to the enrichment and comfort of our homes. And perhaps it is safe to say that there has been no more distinctly-marked advance in any one branch of industrial effort than is to be found in the industries generally devoted to the production of materials for interior decoration of our homes. Yet, while we have gained artistically, the cost of our most effective work has debarred the majority from reaping any advantage, whilst, for the most part, sanitary claims have not had the requisite attention their importance imperatively demand. The object of this article is to bring before the readers of WORK a new product for decorating walls and ceilings that embraces the three essential points mentioned—viz., sanitation, economy, and capability of artistic manipulation of the highest order

The product in question is known in this country as "Church's Wall Decorator," and is the invention of Mr. M. B. Church, of Grand Rapids, Michigan, U.S.A. It has only recently been introduced into this country, and is made by the Church Manufacturing Company, of 127, Pomeroy Street, Hatcham, London, S.E. It has met with enormous success in the United States during the last fifteen years, and to-day the sales are larger than ever, the leading hotels, theatres, public halls, as well as private houses in the great cities, adopting it in preference to anything yet discovered, and mainly, be it noted, on account of its sanitary and economical claims, combined with its artistic possibilities.

Church's Wall Decorator is prepared in the form of a fine powder, and is put up in 7-lb. tins, at 3s. per tin. It is made in eighteen different beautiful tints and white. The base of the material is composed mainly of sulphate of lime, known as gypsum or alabaster, which has been calcined by subjecting it to great heat in retorts till its water of crystallisation is driven off. The other ingredients being added, the whole is ground or crushed by a unique system of milling, also invented and patented by Mr. Church. This patent process separates, polishes, and preserves the atomic crystals of which the base is composed, and tints them without colour enough to hide their lustre. Single crystals, under a powerful glass, are transparent, and, in a body, are opaque like snow. It is easily mixed, being made ready for use by simply adding boiling water, and when used for plain tinting, or as a flat paint, is brushed on with an ordinary distemper brush; but the Company manufactures a special brush, which is strongly recommended for rapid and effective work. It may be well to point out here that ordinary distempers are only inert powders held together temporarily with animal glue or size, which is a ready absorbent of moisture, and soon rots and softens, causing general discoloration and disintegration of the particles. Church's Wall Decorator, on the contrary, hardens and improves with age; the dampness of the English climate is entirely in its favour. It forms a porous rock cement on any surface to which it may be applied, and the colours, having been ground in, and becoming chemically united in the mixing, form solid tints which do not fade. When used as a flat paint, it can be spread over walls and ceilings so fine that, whilst each coat forms a hard porous shell, fifty coats need not produce a surface thicker than ordinary card-paper. Coat after coat can be brushed on without removing the old coat, for the coats never scale or come off. Thus the unpleasant labour of washing walls and ceilings is largely avoided, the surfaces only requiring dusting down prior to each new application of the Decorator.

We now come to consider the various ways of working Church's Wall Decorator in heavy relief. Beautiful effects can be obtained in stalactites or heavy stippling, moulding, heavy or light fluting, scrolls and figures in tints, tiling, glossing, or flashing, bronzing or metallising, blending with stippling and wood-ceiling decorations. Space will only permit us to outline some few of these various modes of working the Decorator, and we then pass on to the general directions for producing these effects.

The decorated frieze with the arboresque pattern is obtained by applying the Decorator thick, and then laying a small flat block of wood on to the composition, removing it immediately; a handsome pattern can be thus obtained in endless variety. The heavy combing, or corrugated work, is done by using a comb with every alternate tooth removed. The cut illustrating basket-work is also obtained by the graining-comb. The more delicate combing is very much admired for walls and panels. The roughened effect is simply the result of the application of a covered wooden block. The specimens given in the illustration to show tile-work are rapidly done, and admit of countless designs. The Decorator takes varnish beautifully, and handsome satin or leather-like effects can be thus introduced.

To Blend a Ceiling in Two Colours.—Mix a small quantity of the colour desired in the centre, and a larger quantity of the deeper tint. Begin in the centre with a light tint, and gradually shade into a stronger tint at the edges. Arrange staging so that the workmen can reach every part of the ceiling, which is easily done by using four step ladders with planks laid across. Commence in the centre and cover a circle of from 5 ft. to 6 ft.; then add a small quantity of the deeper tint, and blend outward from the circle for a small stretch. Keep on adding the deeper colour stretch by stretch until the whole ceiling is covered. By this means a beautiful blend is obtained with any two colours.

For Stippling, Wall Relief-Work, Tiling, etc.—First cover the walls with an ordinary coat, and let it dry. If a light stipple is required, mix four measures of the powder with two and one half measures of boiling water. *Stir thoroughly* till every particle is dissolved, then add one measure of cold water, mix well, and allow to cool. Then brush on, freely passing a full brush several times over the surface, working in strips across the narrowest way of the wall. The stippling is generally done by another hand immediately following the work of the painter, using a soft stippling-brush. Should a coarse stipple be required, mix the material thicker.

For Combing mix the same as for stippling. Use a common graining-comb with the alternate teeth broken out. Draw the comb in a slanting direction, which prevents the teeth from scraping the material clean off the wall where the teeth pass.

For Tile-work mix two measures of the powder to one measure of hot water; stir thoroughly till cool, without adding any cold water. The wall must be worked in small sections. Put on a very heavy coat and stipple with a common stippling-brush. Then block the material off in squares the size of ordinary tiles while it is soft, using a straight-edge and pencil. When this has become thoroughly dried, put on a coat of good quick-drying varnish (oak). When dry, shade and colour the blocks out with tube colours, and varnish as desired. A nice effect is obtained by passing a cloth over the blocks before the varnish is set; this wipes the colour off the raised parts, leaving the background darker, and giving effective lights and shades. Any design can be worked in the tile while the Decorator is soft, only limited by the artistic skill of the workman.

After applying the Decorator, dry as quickly as possible by circulation of air, and by fire, etc., in damp weather. Brushes must be kept in good condition to ensure good work, and should never be left standing in the material all night, but should be washed clean with clear water.

Dry colours can be added to the Decorator, to deepen tints for borders, etc.; but only use strong colours, so as not to weaken the cement. Stencil figures or lining can be put on by simply using clear varnish, and beautiful effects can be obtained by using the various tints over one another with stencils.

The fullest directions are given on the label round each tin of Church's Wall Decorator, but it may also be mentioned here that perhaps the first living authority on gesso-work states that the smooth and even consistency of this material, combined with its simple mixing, makes it the most suitable product yet invented for this art.

In conclusion, we may inform the reader that a cheaper grade, suitable in every way for plain tinting and light stippling, is also made by the same company, and is known as Alabastine. It is put up in 7-lb. tins at 1s. 9d., and, as a general guide, it may be calculated that one pound of Alabastine will cover seven or eight square yards, two coats, on the average wall where there is not much suction.

OUR ART SUPPLEMENT.

DESIGN SHEET FOR WOOD CARVING.

WE give with this number a design sheet, specially prepared for us by the Guild and School of Handicraft, on the application of art and craft to various materials. The accompanying sheet deals with art work in its relation to wood by means of carving, cutting, chipping, incising, engraving, or modelling with the chisel. Hereafter we may take other materials, such as iron-work, wrought or cast, bronze-work, embossed copper and brass-work, tile-painting, clay or plaster-work, gesso-work, flat surface painting, leather-work, etc., in order to show by means of examples and explanatory context what should be the

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right relation of design to material, and what eminent craftsmen or artists at different times have sought to do.

The first thing to be noticed in the accompanying sheet is that most of the work is old work; and from the point of view of the designs this is an advantage, for old designs in matters relating to craftsmanship are better. fuller in character and vigour, with rare exceptions, than modern ones; besides, they have always a style of their own. For confirmation of this the student should go and see for himself and study at South Kensington, or at the Bethnal Green Museum, such specimens of carving and the treatment of furniture as he would find there.

The next thing to be noted is that the design of any part or a piece of work is always made in relation to, and in subordination to, the whole design. An old craftsman never carved a panel first and then worked it into a mantel-top or cabinet; he first designed his cabinet, and then treated the carving or applied ornament in subordination to it, and he never created ornament for the sake of ornament, as is so often seen nowadays. It was a famous aphorism of the great architect Pugiu that "you may ornament your construction—you may not construct your ornament"; and this applies to wood-carving, or any minor art, just as much as to architecture.

Another thing noticeable by reference to the sheet is, that in the old work, *e.g.*, the old French cabinet, the man who made the mouldings was the man who carved the carving, and often designed the whole thing; there was not such sub-division of labour into cabinet-makers, carvers, polishers, turners, etc., as there is at the present day, and the result was that the work, if often not so technically finished in its mouldings or planed surfaces, was a much more pleasing and satisfactory object.

As regards the different methods of workmanship applied to wood-work, the Italian design in the corner shows a very beautiful manner of getting an effect by outlining the design firmly into the wood, rubbing in colour of different tints, and then oiling or polishing the whole. In our own English Elizabethan carving, on the other hand (*e.g.*, instance of the mantelpiece at Queen's College, Cambridge), the effect is got by very flat cutting, leaving larger portions of background.

Italian carving, such as is shown in the three feathery leaves from an old chest, was based mostly on gesso-work. That is to say, the Italians designed and treated carving as they treated gesso-work—in smooth and slightly relieved surfaces—their method frequently being to coat their carving over with gesso, and model in it. It is to mediæval England, France, and Germany, however, that the workman carver of to-day should look for his best examples and studies, see the patera of the lion's head on the sheet, and a portion of the carving of the Black Prince's tomb at Canterbury Cathedral, one of the most beautiful pieces of work ever done in carving for dignity and refinement. It is to such guides as these that the student and craftsman should chiefly apply himself.

Those who are eager to pursue a line of study in this direction may possibly find it of use to them to put themselves in connection with the Guild and School of Handicraft, which they can do by communicating with the Hon. Director, 34, Commercial Street, E., stating at the same time the line of work they are engaged in, and what it is they wish to study.

THE MECHANICAL PROCESSES OF SCULPTURE.

MODELLING—CASTING—CARVING.

BY MARK MALLETT.

PRELIMINARY OBSERVATIONS—A GENERAL SKETCH OF THE SUCCESSIVE PROCESSES.

IT is not supposed that the papers to be given under this title will make a Phidias or a Michael Angelo of whoever reads them—in the making of an immortal sculptor something more than a knowledge of mechanical processes is demanded. He must have the divine gift of genius and artistic knowledge. But apart from any view to the highest ranges of art, an acquaintance with such matters as modelling in clay, casting in plaster, and carving in marble and stone, will be of practical value to very many persons; whilst others may find in them pleasing and interesting pursuits. These mechanical processes are as capable of being taught by printed directions and diagrams as are any other ordinary handicrafts.

Some persons there are who suppose that when a sculptor sets about making a statue he simply takes his hammer and chisel, and hews it at once from a block of marble; and true it is that this has been done by some sculptors. Michael Angelo is recorded to have worked in this manner. But such is not the ordinary method of proceeding. Ordinary sculptors are not Michael Angelos, and cannot tread in his footsteps; they proceed in a more cautious and systematic manner. According to the usual practice, a marble statue is the outcome of three distinct mechanical processes—modelling, casting, and carving; whilst at the different stages of its growth it appears in three totally different materials—clay, plaster, and marble.

The work is first modelled—that is, built up in plastic clay, in which material alterations can be freely made; when completed in this, and when no further improvements seem desirable, it is cast in plaster, and the clay model destroyed; and from the plaster cast a fac-simile in marble is afterwards carved.

This is the ordinary course in fine art sculpture. In some inferior departments, as often in architectural sculpture, the carver may hew out his figure from the block with nothing more to guide him than a rough drawing. But this is work in which rapid execution rather than excellence is the thing desired. It is scarcely to be expected that anything really good can be produced by such crude and hasty means. Even Michael Angelo, great as were his powers, found it desirable to make small anatomical studies of his subjects before he attempted to hew them from marble. And it may be questioned whether, after all, either he or the world gained anything by his daring manner of working. Had he been content, like other sculptors, to make clay models, meaner hands might have hewn away much of the hard marble for him, and those numerous works might have been completed which he, tired of the vast labour he had taken upon himself, threw aside unfinished.

To those who have imagined the sculptor as working wholly in that noble material, marble, there may seem something degrading in the idea that his chief employment is really among common clay. Such is, however, the case. It is in the clay model that he exercises his artistic skill, his powers of imitation and invention, or shows his sense of beauty. The carving in marble is mere copying, and can be, and is, mainly left to workmen.

Those who know nothing of modelling naturally think that handling wet clay must be dirty and disagreeable. This, however, is a mistaken notion. A pure clay, such as the pipe-clay generally used, is both cleanly and pleasant to the touch; it does not roughen the hands, it easily washes off, and takes with it all dirt. It looks not unlike putty, and is used a trifle softer than putty is used by glaziers. For medallions and other works closely attached to a background, the natural cohesion of the clay affords sufficient support; but for busts, statues, and the like, a framework of wood or metal has to be provided to bear the weight of the clay.

In the case of a bust (that most frequent subject with the sculptor, whether professional or amateur), this frame is a very simple affair. It is generally an upright piece of wood, with a short cross-arm at its top to support the head. Round this frame the modeller builds his mass of clay, laying on and pressing down new pieces with his hands, and occasionally using a large wooden tool. For this first stage he likes his clay to be very soft and plastic, and does not at present attempt to get any near approach to form. When he leaves it, after building it up, it is but a wild caricature of a human head and shoulders.

It is allowed to rest for some hours, that the clay may to a certain extent stiffen, and when he again comes to it, though still sufficiently pliable to be readily moulded, it will be sufficiently set to allow him to lay on more clay without displacing the surface, and to give some approach to the broader and more obvious forms. And thus he will proceed, mostly during the earlier stages with his thumbs, and afterwards with a freer use of his wooden tools, to build and fashion it into shape, till every form is correct, and till he has brought the surface to a proper degree of finish.

All this time he has had to keep his model damp. Were it allowed to get dry, the clay composing it would become too hard to be worked upon, and then shrink and crack. It is kept damp till the time comes for casting it in plaster, and, before casting, the last thing done is usually sprinkling water upon it.

No sooner is the clay model finished than the sculptor is desirous of converting it into plaster. The soft clay is liable to many accidents, and needs constant care, whereas the plaster cast is comparatively secure, and can take care of itself. Plaster of Paris is therefore spread over every part of the surface, to form a mould. From this mould the clay model is dug out and thrown aside; the mould is washed and more plaster poured into it, and this forms the cast. When the mould has been chipped away, the model reappears in all its details, only, instead of the soft, dull, grey clay, it now appears in hard and dazzling white plaster.

To transfer the form from clay to plaster is a thing that may be done quickly and easily, but not so when the form has again to be transferred from plaster to marble. This is always a slow and difficult operation, notwithstanding that in modern times it has been facilitated by improvements in the pointing-machine. This machine is an apparatus—of which more will be said in the proper place—which enables measurements to be taken from the plaster model, and recorded on the marble with mathematical accuracy, thus enabling the workman to hew

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away superfluous material with more freedom and rapidity than would otherwise be possible.

The workman who does this is called a "pointer," and when he has chipped away the block of superfluous marble, the more artistic carver comes with his chisels, his rasps, and drills, and gradually works down the hard surface till he has copied into it every detail of the plaster model. Finally, he gives a beautiful surface by rubbing with wet sand. Busy sculptors—men of note and much employment—rarely have time for much carving, and leave it to skilled workmen, only, perhaps, putting some few corrections and finishing touches to the marble.

This brief sketch of the phases through which a marble bust passes is intended to give those who have previously known little on the subject so much of general knowledge as may enable them more fully to understand the practical details of the different processes, which will be dealt with in future papers.

It has, perhaps, been too much assumed, in the above sketch, that modelling and casting are merely means to the production of a work in marble; but this has been for convenience, and because a work in marble is commonly regarded as the highest and most important outcome of the sculptor's art, rather than from any wish to ignore the fact that modelling and casting have their uses, apart from any intention of marble work. We are quite aware that probably more persons would wish to obtain a competent knowledge of those processes with a view to other ends, and shall bear this in mind as we go on.

CHINA AND GLASS RIVETING.

BY W. E. DAW, JUNIOR.

ITS SUITABILITY FOR AMATEURS—MATERIALS REQUIRED—THE DRILL: HOW TO MAKE IT—BRASS WIRE FLATTENED ON ONE SIDE—MARKING HOLES ON PLATE—HOW TO WORK DRILL—HOW TO MAKE THE RIVETS—FILLING UP HOLES—WHERE TO BUY MATERIALS—CONCLUSION.

THE art of mending broken china or glass by clasps, or rivets, of brass wire is eminently suitable for amateurs, for not only is it very easy to learn, but the materials are inexpensive, and the work is soon done.

Having said this, hoping to encourage some one to take up the pursuit, let us consider, first, the materials required.

We shall need a drill, some diamond bits, a pair of combined cutting and holding nippers, some brass wire, and a little plaster of Paris. This completes the list.

By referring to Fig. 1 you will see the drill is a steel rod, moved by tapes fastened to a piece of wood, which plays up and down. This can be bought, or the amateur can make it for himself:—Get a steel rod about 14 in. long, tapering at one end. Sometimes worn-out cotton spindles can be bought very cheap; these answer splendidly, as they are already tapering. Take it to a blacksmith (if you cannot do this yourself) and have a piece cut off the other end and a hole drilled through to take the tape. Turn up a piece of box or ebony, about 2¼ in. by 1 in., as shown at B. When you have got it to the proper size, drill a hole through the middle slightly smaller than the steel rod, so that it will hammer on tightly. Be careful to make this hole true, or it will wobble. Drill first one side at the centre mark, and then the other; or, perhaps, the better way will be to hammer on and true up in the lathe. Now take another piece of the same wood, and turn to your own fancy to about 7 in. or 8 in. long, and ¾ in. thick, as at C; drill a hole through this also, but larger than the steel rod, so that it will play up and down easily (this is for the fingers to take hold off, to give motion to the drill); pass the steel rod through this, hammer the ball on to about

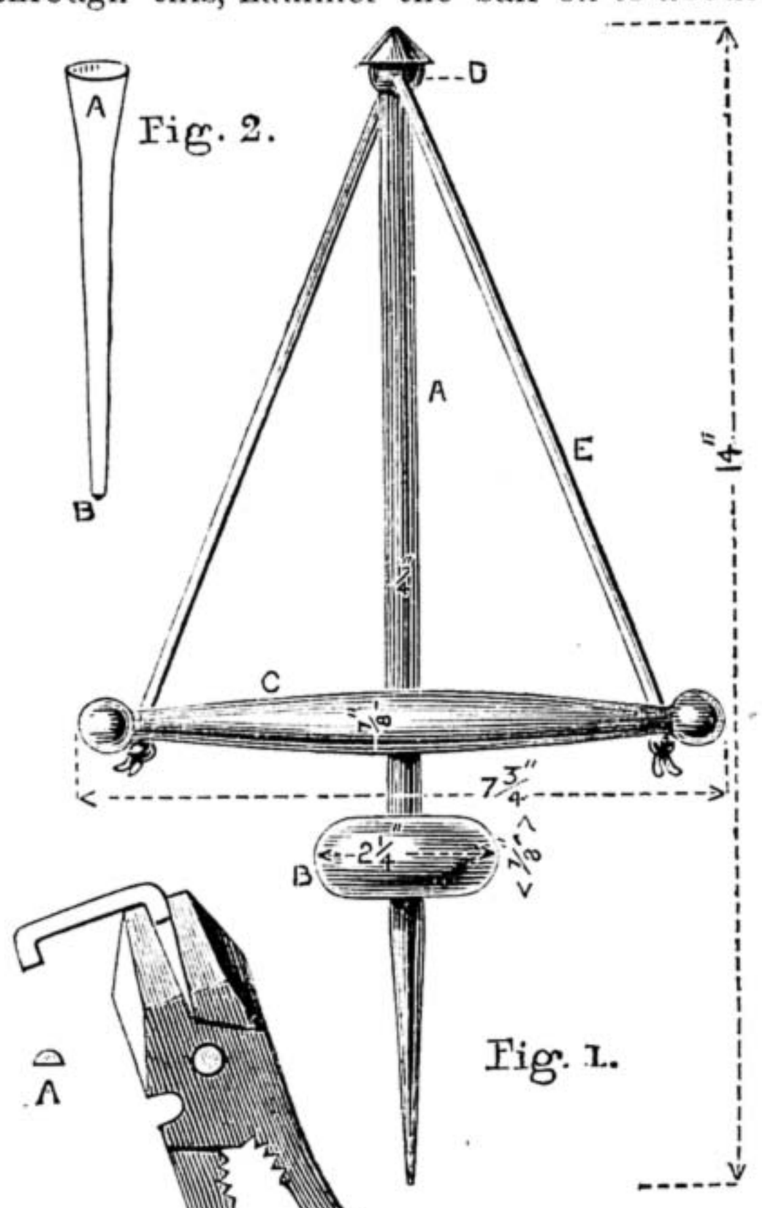

Fig. 1.

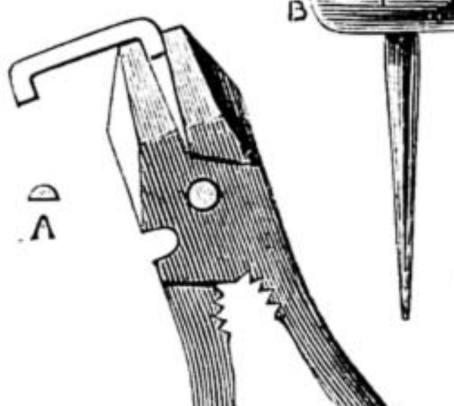

Fig. 4.

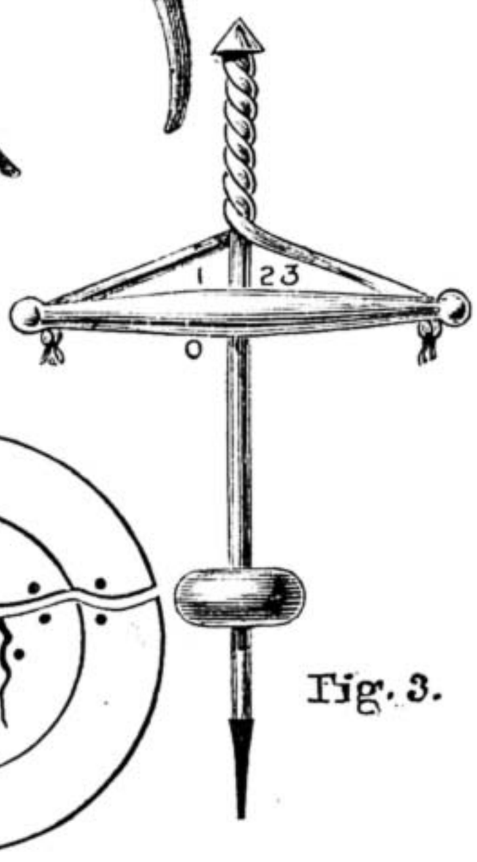

Fig. 5.

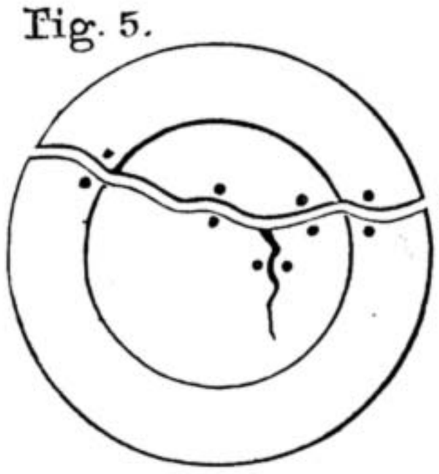

Fig. 3.

Fig. 1.—Drill for China and Glass Riveting, showing Dimensions. Fig. 2.—Diamond Drill Bit. Fig. 3.—Drill wound up to commence Drilling. Fig. 4.—Nippers for bending Wire. Fig. 5.—Plate drilled for Riveting.

one-fourth of the rod, tie one end of a piece of tape or leather to one end of the finger-piece (or drill a hole in each end, and tie the tape in a knot underneath), pass the tape through the hole D in the rod, fasten the other end, and the drill is complete.

The drill bits (Fig. 2) are pieces of tin made to fit tightly on the steel rod of the drill, with a rough diamond point cemented in the other end. As these require a little practice to set properly, the beginner had better buy them ready-made—at any rate, at first.

The brass wire used is about 12 to 16 B.W.G., mostly the latter size, and it must be flattened on one side, either by file or scraping with an old knife. A quick way of doing it is to hold the brass wire down on the right thigh with the blade of the knife, and draw sharply with the left hand past the knife two or three times, when sufficient will be taken off for the purpose; but I must caution the beginner not to do this without he has an apron, or something over his knee, as the wire gets very hot, and he *may* find a hole somewhere when he has finished.

Now we are ready to begin. Suppose we have a plate, as in the illustration, with a piece broken out, and cracked also; join the plate, and turn bottom upwards, as we shall rivet the wrong side, so that it may not show when hung on the wall, or when in use. Now mark, with a steel point dipped in oil, on both sides of the break and crack where the rivets are to go. I may say the old oil off an oilstone, or hone, is the very best thing to mark with, as it makes a black spot which is easily seen. Be careful to make the rivet holes exactly opposite each other. Now take the drill, to which you have fastened an appropriate-sized bit (for a small plate you will, of course, use a small gauge of wire and small bits; for a larger plate, thicker wire, and proportionate-sized bit); take one of the pieces of the plate, and having broken the glaze, either with the diamond or a steel drill set in a handle and sharpened on a hone, grasp the wood handle of the drill with the thumb and first finger on the left side of the steel rod, and the second and third fingers on the other side; twist the tape round the rod, as in Fig. 3; press slightly, when it will uncoil, and, by raising the hand at the proper moment, coil in the opposite direction. It will, perhaps, not be easy at first to get a continuous motion, but it will soon come. It is a similar action to the treadle of a lathe, only performed with the hand instead of the foot. Practise at first without the bit upon a piece of wood. Drill as deep as the article will allow, using plenty of oil. Having drilled all the holes in one piece, proceed in the same way with the other; then take some of the prepared wire, and turn down at right angles with the nippers one end about $\frac{1}{16}$ in. or $\frac{1}{8}$ in., according to the depth of your holes, keeping the flat side of the wire underneath; place this in one hole, and carefully mark where the bend ought to come; cut off, and turn down the other end. When you have finished all the rivets, proceed to fix, when, if properly made, they ought to fit tightly; in fact, it will be all the better if they require a slight tap with a small hammer, but see to it that none of the ends are so long as to prevent the rivets lying flat on the plate.

Mix a little plaster of Paris with water, and fill up all the holes, and also the cracks, if there be any.

The plate is now completed, and, if carefully done, will hardly show upon the right side, and also be very strong, and, if required, will stand everyday usage for a considerable time.

Some, perhaps, will be glad to know where to buy the diamond bits and other materials; in that case, I can strongly recommend Mr. E. Claxton, Tower Street, King's Lynn. Everything required can be obtained of him, and he is very reasonable in his charges.

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CANOE BUILDING IN WOOD.

BY AN OLD OARSMAN.

VARIOUS MODES OF BUILDING—TIMBER—TOOLS—ROB ROY CANOE—SHEER BODY AND HALF BREADTH PLANS.

EVERY man should be able to *build* his own canoe as well as paddle it, and with this view the following remarks are penned, and in the hope that numerous men will construct and navigate their own craft.

There are several methods of canoe building: *i.e.*, clincher, carvel, riband carvel, dowel, and diagonal, each of which has its merits for the usual purposes to which the boat when constructed is to be put.

Clincher or Clinch Build (Fig. 1).—In this the planks are nailed edge to edge, each overlapping the other some half inch, and then fixed with copper or other metal nails, though copper is by far the best; and when the planking is all in place, the timbers are fitted in, nailed, and *roughed* in their places. Before nailing, the under plank is chamfered off at an angle to allow the plank when nailed to take its proper curve.

Carvel Building (Fig. 2).—In this the planks are fitted edge to edge *upon* the timbers, which have been fitted in their places before, and when perfectly secure they are caulked in some way or other to make them watertight: some are puttied, some have cotton or oakum riven between the planks, others have white lead only, or a thin sheet of indiarubber so that a tight seam may be ensured.

Riband Carvel (Figs. 3, 3 A, and 3 B).—In this method of building the planks are tacked on to the building moulds edge to edge and closely fitted, then ribands of clean straight-grained oak, chestnut, or cedar, 1¼ in. wide and from ¼ in. to ⅜ in. thick, are placed along the inside of the joint in the planks, when they are nailed to both edges of the two planks and the nails clenched inside, the nails being driven from the outside; but to ensure a tight joint, lengths of linen or calico running the entire length of the joint in the planks are laid on and well varnished or painted, so that they cover the entire under side of the riband or batten. The result of this plan, when finished, is a very neat strong joint with an almost perfectly smooth outer surface; when all the planks and ribands are fitted in and nailed, the timbers are fitted and nailed in; these timbers should be about ⅜ in. on the side by ¾ in. moulded.

Dowel Building (Fig. 4).—This is used where thicker planking is required, and is done much the same as carvel, inasmuch as the planks are fitted edge to edge, but as

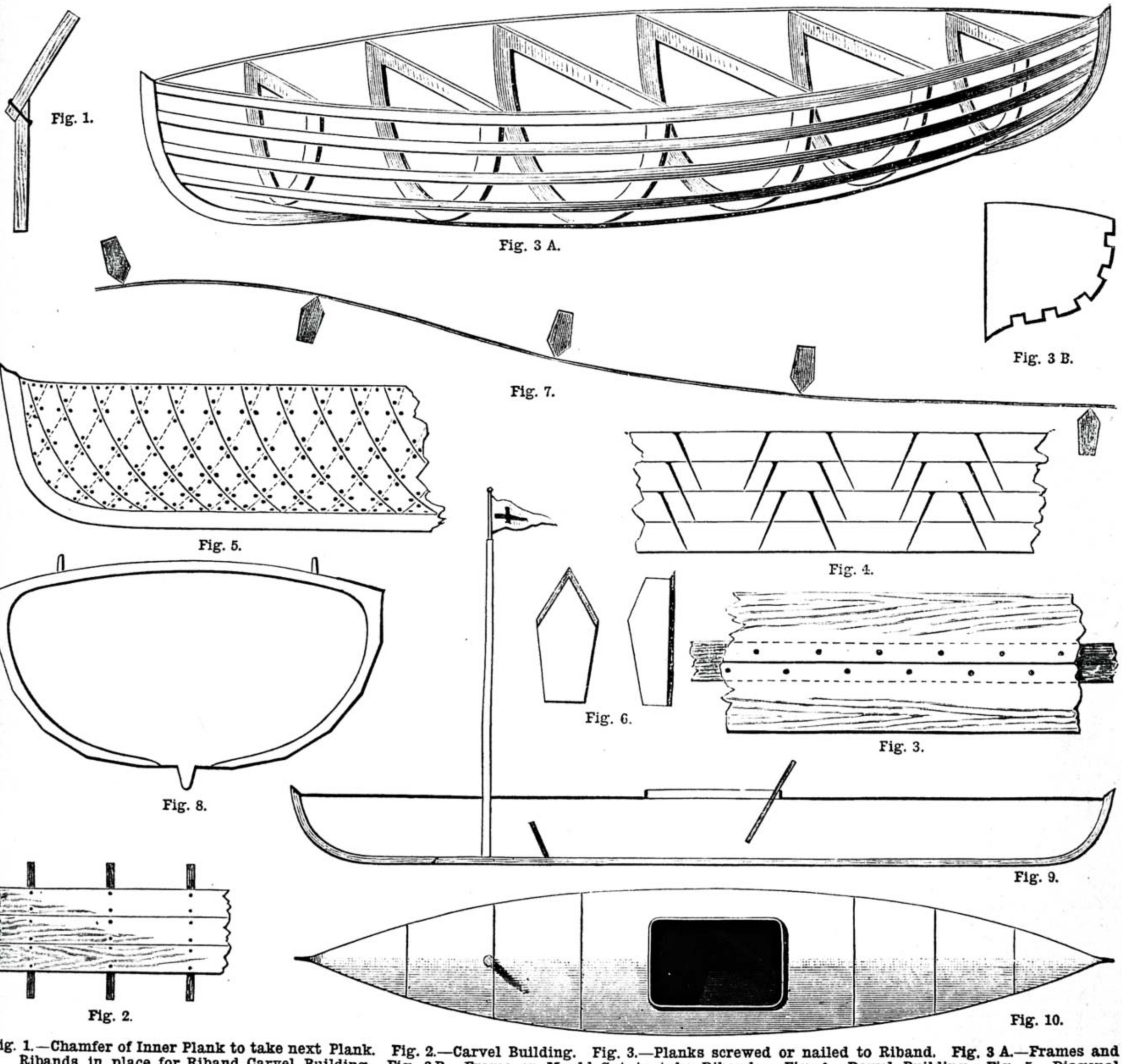

Fig. 1.—Chamfer of Inner Plank to take next Plank. Fig. 2.—Carvel Building. Fig. 3.—Planks screwed or nailed to Riband. Fig. 3 A.—Frames and Ribands in place for Riband Carvel Building. Fig. 3 B.—Frame or Mould Cut to take Ribands. Fig. 4.—Dowel Building. Fig. 5.—Diagonal Building. Fig. 6.—Weights for Drawing. Fig. 7.—Spline held in place by Weights. Fig. 8.—Midship Cross Section showing Coamings of Well. Fig. 9.—Rob Roy Canoe: Sheer Plan. Fig. 10.—Deck Plan, showing places of Timbers for support of Deck.

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succeeding planks are fitted, nails are driven through the planks from the upper edge into the plank beneath, but each should be driven *diagonally*, in a different direction to that before it; of course long nails are required for this plan. and when the skin is completely formed the timbers are fitted in; generally they are simple lengths of wood, or battens which have been steamed, and are forced into place and nailed there. When they dry they are very strong, as the grain is continuous and easily takes the strain.

Diagonal Building (Fig. 5).—In this the planks are laid in two thicknesses, the first from the keel to the gunwale at an angle of about 45°, the next across it at an angle, or else longitudinally, over the moulds; the outer skin is nailed to the inner skin with nails at each corner, where they cross each other; the best-looking work is with the outer skin longitudinal, but the strongest is when both skins are diagonal.

Oak.—Having decided on the method of planking you intend adopting, you should next determine on the wood you intend employing, as some kinds are so much heavier than others, and for a canoe would be too cumbersome. Undoubtedly oak is the best for all purposes, knocking about in foreign countries or our own coasts; but when weight is an object, a lighter wood should be used. Below is given a table of the weights of various woods, a cubic foot of each kind having been carefully weighed:—Spanish mahogany, 55 lbs.; oak, 50 lbs.; Honduras mahogany, 40 lbs.; yellow deal, 33 lbs.; cedar, 30 lbs. Therefore a canoe built of oak would be about half as much heavier than one built of cedar: a very important difference in a day's paddle or long journey.

Cedar.—This wood is very apt to split when much exposed to the hot sun, is a very nice-looking light wood, easily worked, and for most purposes is found sufficiently strong; but if the canoe built of this wood gets aground on a rock or a snag, in all probability the plank will be split by the mere efforts to get her off, causing motion which will do the damage. In selecting this wood for a canoe it should be entirely free from knots and shakes, though small sound knots will not do much harm.

Red pine is a wood, hard, heavy, and full of turpentine, and though not often used in light boats, it is very durable if the wood has been carefully selected so as to be sound and straight in the grain; occasionally fishing and ships' boats are built of this wood, and with very good results.

Yellow pine, or *spruce*, is sometimes used for canoe building, but is far more commonly used for the spars and paddles, being both very light and strong; it is also close grained and quite free from knots. If on a journey with your mast up you come in contact with a tree, bridge, or other obstruction, the spruce mast will break short off at the deck, without bursting it and the beams, carlings, etc., all to smash, which would certainly be the case with any other hard and tough wood.

Honduras mahogany is a good wood, being strong, hard, and handsome; it is nearly everlasting, as hardly any insects will touch it; in weight it is about a sixth lighter than oak, though Spanish mahogany is rather heavier.

Spanish chestnut is often used for timber of canoes, being hard, strong, and capable of standing shocks and strains, and is long in decaying.

Birch is a very useful wood for light work and strength combined, such as in beams, timbers, carlings, coamings, or in such positions.

Ash is another most necessary wood for canoe building, as it is the very best thing you can get for coamings to the hatches, for rubbing pieces or bilge keels, or for wales round the vessel; sometimes it has been used for stem and stern posts.

TOOLS REQUIRED FOR BUILDING A BOAT OR CANOE WITH.

Planes.
Jack, smoothing, rabbet, pair of match, round sole, beads.

Chisels.
Firmer, mortise, and others of various widths and sizes.

Saws.
Rip, panel, tenon, compass (fine), hack.

Gouges of Various Sizes.
Draw knives, spoke-shaves, mallets, hammers of various weights.

Bits.
Brace and sets of quill centre and American, from 1 in. downwards.

Gimlets, rose, counter-sinks, a driver and broach, Archimedean drills, scrapers, brad-awls, screw compass, adze, axe, hatchet, chalk line and chalk, punches, pincers, rooving-iron, nippers, hand-vice, a small handy anvil, 2 ft. rule, a steel roll-up measure with scale marked on it. This is very useful for measuring the bilge of the boat. Compass and square, straight-edge, cramps, both of wood and iron, for holding the planks in place whilst fitting and nailing, a work bench fitted with a powerful vice—or a substitute may be made with a plank 2 to 4 in. thick by 9 to 12 in. wide by 12 to 18 ft. long, screwed to three strong trestles of the same height. A long bench of this kind is exceedingly useful for planing up the planks on.

All tools should be kept very sharp, and if a plane or saw is rusty or dirty, chalk it.

The old Rob Roy canoe appears the best kind for an amateur to construct, that being the original of all our canoes; then when well advanced in the management of a Rob Roy, the amateur may proceed to construct any of the other varieties, such as a Ringleader (single or double), a Nautilus, a Pearl, a Mersey or Humber, Canadian or American canoe, various sorts of which are used for paddling, paddling and sailing, or simply for sailing; some travelling canoes are used for sleeping on board, being provided with tents for the purpose, but a man had better begin at the commencement, and thus cannot do better than build a pure Rob Roy, the measurements of which are 14 ft. in length, 28 in. in width, and 9 in. in depth from keel to deck amidships, but the best guide for the depth is the length of the foot, as when under the deck there should be sufficient room for the foot to turn easily, otherwise the toe and heel may get firmly set fast, which would be a source of the greatest danger in case of a turn over, as a man could hardly extricate himself from such a position when in the water; at least a foot in the clear is the best depth to adopt. A Rob Roy canoe when complete for use should not weigh more than from 60 to 70 pounds; some are much lighter than this when built expressly for lightness, but 70 pounds is not too much for an average man to manage, and carry round any gate or lock he may meet with, and if grass has to be crossed it is very easy to drag the canoe over it by the painter.

Having decided on the class of canoe you intend building, you must proceed to make drawings of the design, which is supposed to be for a Rob Roy.

To do this you must procure a drawing board, about 24 in., some drawing pins, a sheet of cartridge paper, a pair of dividers, a T square, a 2 ft. rule with $\frac{1}{8}$ths and $\frac{1}{16}$ths in. marked, a scale divided from $\frac{1}{2}$ in. to the foot up to 2 in. (this may be on the edge of a parallel rule), some curves of various shapes, which you can easily make yourself of sycamore, pear, mahogany, or other wood, splines or battens, of same woods, or deal, with which to put in the water lines or other longitudinal lines, and three or four weights (Fig. 6), which can easily be cast in lead from a pattern of your own making, and be shod with some hard wood screwed firmly to the lead with three screws, the point having a small notch in it to take the spline, as shown in Fig. 6. In using the splines, one is placed on the spot where the line starts from, and a weight is rested on it; it is then bent so as to intersect the next point, when it is secured by another weight, and so on to the end (as in Fig. 7), where the spline is adjusted so as to exactly touch the points through which the line will go; a pencil or drawing pen with Indian ink is run along it, making the desired line.

Every design for a canoe or other vessel always consists of three separate plans, neither of which can be worked from unless in conjunction with the other, and each must be so correctly drawn that every part of the three plans must correspond exactly with each other. These three plans are known as the sheer, body, and half-breadth plans. The longitudinal vertical section shows the outline of the length of the boat, and is known as the sheer plan (Fig. 9); the vertical cross-section at various distances along the sheer plan is known as the body plan; the longitudinal transverse section of the canoe at the deck line, the water line, and other positions parallel to the water line is called the half-breadth plan.

It is not necessary here to enter into too many technicalities, but to proceed with a description of making the design for a Rob Roy canoe. The commencement is made by drawing in the sheer plan (Fig. 9), which contains the length, depth, sheer, and outline in general of the canoe. The load water line is first marked on the plan; the length the canoe is intended to be is then marked off to scale on this load water line, and from it the intended free board at the lowest point amidships; the height of the stem and sternpost is marked off, and from these points the sheer is marked in by a spline or batten touching each of these three points; you next determine the depth your canoe is to be: this must be measured from the top of the gunwale to the top of the keel, and then a line is put in below this to show the full draught of water to the under side of the keel band. You can if you like put in other lines to show the different water lines at different depths of immersion. The sheer plan being completed, you commence on the body plan, the paper being of sufficient size to admit its being drawn on one side of it. To begin with, draw a perpendicular line, which is the dividing line between the fore and aft sections: the largest is the midship section, which is in general about midway between the stern and sternposts, but sometimes it is some space aft of the exact midships, and in general should be so, as the weight of a man's body is usually in the after part of a canoe, and then there should be the greatest power of floatation or breadth to support the cargo, *i.e.*, the greatest area.

The line of greatest draught should be drawn in from the same plan, and the intended thickness of the keel should also be put in; the beam, both on water line and deck, can now be put in with the curves, the midship section (Fig. 8) having been decided on; the breadth of beam at the water line and on deck must be marked in with curves or splines, bearing in mind that it is only necessary to draw in half the fore breadths on one side and half the

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after breadths on the other: these are best put in by pricking them off on the perpendicular lines with dividers.

Having finished the sheer and body plans, the next thing to do is to draw in half the half-breadth plan: this is done by drawing two perpendicular lines to represent the total length of the vessel over all, taking the length from the sheer plan, the half breadth being placed exactly under it. The place of the midship section (Fig. 8) having been decided on, usually somewhat aft of the exact midships, it is drawn from the sheer plan right down through the sheer plan to the middle of the base line of the half-breadth plan. You can also mark in as many other sections as may be thought necessary; the deck line can now be run in with a spline, the beam being taken from the body plan; next you mark off with the dividers the distances of various bow and stern sections on the deck line, and run them in with a spline; you can then mark off the water lines on the half-breadth plan from the body plan, and having these points all shown, take a spline, and making it touch all the positions shown, draw in the curves.

It is not necessary to enter into too many technicalities in the design for a canoe, as these can be ascertained from most books ou boat and yacht building if one wishes to construct larger and more important vessels, where much greater exactitude is required, but what is given above is quite sufficient to enable an amateur to build a simple Rob Roy canoe.

HIVES AND OTHER APIARIAN APPLIANCES.

BY APIS.

Introduction—Abbott's Makeshift Hive.

I have been asked to write simple and comprehensive instructions as to the manufacture of those appliances for bee-keeping which can be made at home by a man of ordinary mechanical skill. I may, therefore, explain at once that my aim in the following pages will be to make things as simple as possible, so that they will be understood by all. At the same time, I will endeavour to show the principles which govern things, so that any person can do that which is most suitable to his own pocket and requirements.

Bee-keeping has now become a science—or, more properly, a science and art combined. The bee master is a king amongst his tiny subjects, as absolute as the Czar of Russia or the Shah of Persia—far more absolute, indeed, than the most despotic monarch would ever dare to be among men. He regulates the affairs of their household, arranges their marriages, the strength of their forces, the proportion of males to females, their comfort in summer and in winter. He partakes of the fruits of their labour, and causes them to procure far more honey than their natural instinct would prompt.

All these powers, and several others, are due to the invention and perfection of the bar-framed hives.

I suppose in the early ages of the world's history a savage of more than ordinary intelligence must have had his curiosity aroused by seeing numerous buzzing insects enter the hollow trunk of some decayed tree. He may have been induced to examine the tree more closely, perhaps to split it open with his stone axe. If the reception he got was not too warm, he would have been amply repaid for his trouble by obtaining his first taste of honey, which, after the manner of savages, he would surely pronounce "Good."

But his stock of this delicious food would depend on chance discoveries in the forest, and accordingly, when he saw a cluster of bees clinging on to some branch or tree, he would be tempted to imprison them—perhaps in his hat, if he had one, which appears likely to be the origin of the straw skep. This method of keeping bees was developed, and became almost universal until quite recently. Then science stepped in, and calculated that from ten to twenty pounds of honey were consumed by the bees in manufacturing one pound of wax, and as honey and wax were about the same price then, it was evidently a loss of about two thousand per cent. to the bee-keeper. The idea struck somebody that if he gave the bees a lump of wax, they might be induced to utilise that and save the honey, but they would not touch it. Then he thought of reducing the wax to thin sheets, but the bees would not touch it even in that condition. The next step was to impress the foundation of the cells upon the sheet of wax, and the bees were found to take kindly to it in this condition, to draw it out into perfect combs for brood and honey. The modern bee-keeper, therefore, supplies his bees with sheets of comb foundation, which can be purchased at a cheap rate, and will save at least ten times its cost.

One of the advantages of the movable frame hive is the facility with which comb foundation can be fixed in it, but it is only a minor advantage, for with a little management foundation can be fixed in almost any hive. The principal is the ease with which all the combs and the health and condition of the inmates can be examined.

It is sometimes found that the queen of a colony has got lost by some means, and if there are no eggs or very young larvæ with which to make a new queen, the fate of the colony is doomed except a new queen is provided, and the bee-keeper could scarcely ascertain the loss of the queen were he to use the ordinary skep hives. Again, towards winter some colonies have more than enough stores, while others, if left to themselves, would die of starvation before the spring came. But the bee-keeper averts that catastrophe by giving to the weak ones some of the superfluous stores of the others. This shows not alone the advantage of the movable frame hive, but the necessity of having all the frames in an apiary interchangeable. Sometimes we obtain stocks from other apiaries, which, if their frames were not fitted to our hives, would reduce their value considerably. All this points to the fact that there should be a standard size of frame used throughout the country.

The British Bee-Keepers' Association has recommended as a standard, frames 14 in. long and $8\frac{1}{2}$ in. deep, the top bar being 17 in. long, $\frac{3}{8}$ in. thick, and $\frac{7}{8}$ in. wide; the sides $\frac{1}{4}$ in. thick and $\frac{7}{8}$ in. wide; and the bottom $\frac{1}{8}$ in. thick, the width being about $\frac{1}{2}$ in.

These are the sizes recommended by the Association, but the important thing is the external dimensions of the frames, and the thickness of the stuff of which they are made is immaterial—within limits, of course. I always make the top bars $\frac{1}{2}$ in. thick, and the sides nearly $\frac{3}{8}$ in., the bottom being $\frac{1}{4}$ in.

Fig. 1 is a fully-dimensioned diagram of a frame that is now before me, which I can recommend as being easily made and thoroughly efficient. The external dimensions are those recommended by the Association, but the wood is somewhat stouter, as I find it much easier to put together than when it is very fragile. The frame is hung from the sides of the hive by the extending lugs of the top bar. A few more data, and we can proceed to the construction of our first hive. It has been found out that bees build their combs $\frac{7}{8}$ in. thick, and that they require a space of about $\frac{1}{4}$ in. at each side of them to move about in. This would make it requisite to allow $1\frac{3}{8}$ in. for each comb or frame. A little more, however, is generally allowed—viz., $1\frac{1}{2}$ in. slack, or, to be more accurate, $1\frac{9}{20}$ in.

The internal dimensions of our hive are, therefore, fixed for us: $8\frac{1}{2}$ in. deep, thus allowing the thickness of the top bar under the frames for the bees to move about in; $14\frac{1}{2}$ in. long, which allows $\frac{1}{4}$ in. at each end of the frames for the passage of the bees; and $1\frac{9}{20}$ in. wide for every frame we intend to use. The general number of frames employed is ten, which, with two dummies of equal thickness, would be twelve. $1\frac{9}{20}$ in. multiplied by 12 would give us, say, $17\frac{1}{2}$ in.; therefore the dimensions of our hive inside will be $14\frac{1}{2}$ in. × $17\frac{1}{2}$ in. × $8\frac{1}{2}$ in. I may remark that the ordinary 9-in. boards come in very handy in the construction of hives.

A few more particulars must be kept in mind. If a space much larger than a quarter of an inch is left in the hive, the bees will begin to build comb in it, and if smaller chinks are left, they will stop them up with a glutinous substance, called propolis, obtained from some trees; and this is not alone messy, but it wastes the time which the bees might employ in collecting honey. If any parts of the hive have to be moved—*e.g.* the frames or dummies—their contact with the fixed portions should be as small as possible—mere lines, if practicable, for this will prevent them being stuck firmly with the propolis.

If any person tries to fasten the edge of a thin ruler to a piece of board with glue, he will have a practical illustration of the difficulty of fastening two small surfaces together with a sticky substance. Other requirements will suggest themselves as we proceed; for the present I will pass on, as I can imagine some to be impatient at this long preamble.

The Tools required for Hive Building will vary very considerably with the talent and power of accommodation of the workman. I have seen a man do nicer and better work with a jack plane and saw, with hammer and square, than another could do with a whole shopful of tools.

A fairly complete set would include the following items: jack, smoothing, and trying planes; shooting board; hand and tenon saws; square, 9 in. long; two chisels, 1 in. and $\frac{1}{2}$ in.; marking gauge; hammer, awls, screwdriver, and rule.

This is not a very extensive kit, and yet I think I have mentioned everything that is absolutely necessary. In the course of this series I hope to describe a few more tools and appliances, including a circular saw, which, if not absolutely necessary, comes as near being so as anything could possibly be.

The first hive I will describe is a modification of

Abbott's Makeshift Hive.

It consists of a box $14\frac{1}{2}$ in. long, $17\frac{1}{2}$ in. wide, and with the long sides $8\frac{1}{2}$ in. deep, while the others are 9 in. deep, all inside measurements. To make it, procure 7 ft. of wood 9 in. wide. Yellow pine is undoubtedly the best wood for hive making, but red deal, or

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even white deal, would stand a long time, if dry and well painted. The thickness of the wood used may vary, but, as a general rule, ¾ in. planed, which will then measure about ⅝ in., may be employed for most parts of hives, except where otherwise specified.

The seven feet of wood being planed, a length of 35¼ in. may be cut off; one edge of this is then shot true with the trying plane, and bevelled to an angle of about 45°, leaving about an eighth flat, as seen in Fig. 2. Then set the gauge to 8½ in., and mark a line on the board that distance from the bevelled edge. Run the saw a little outside the mark, and with the trying plane true the edge square to the surface until the mark is reached. Cut the piece into two, each 17⅝ in. long, and lay one over the other, having the bevels out. If the pieces are placed exactly over one another, the edges will be found to coincide; but, except the square was true and the sawing carefully done, the ends will not be exactly even. The pieces should therefore be clamped together, if necessary, with two screws passing through them, and the ends shot at right angles to the sides and surfaces with the trying plane and shooting board. The pieces will now, probably, be only 17½ in. long, but if they are longer it makes no matter; they may be taken asunder and the screw-holes plugged, either now or afterwards, with wooden plugs glued in.

The remainder of the board, measuring a little more than 4 ft., may have its edges now shot, and two pieces, each measuring 16 in., cut from it. One of these may now have a space cut for a doorway 4 in. at each side of the centre and ⅜ in. high, making the doorway thus 8 in. long and ⅜ in. high.

Lines may now be drawn with the pencil and square 7¼ in. towards each side from the centre of these boards, thus having the lines 14½ in. apart. With an awl bore holes a quarter of an inch outside these lines, and the hive is ready to be nailed together.

Bring the inside edges of the ends of the long pieces (having the bevels turned out) to the pencil lines marked out on the short ones, and put a nail about the middle of each board, being careful to have the lower edges of the boards on the same level. The nails used had [illegible] t be cut joiners' brads, 1½ in.

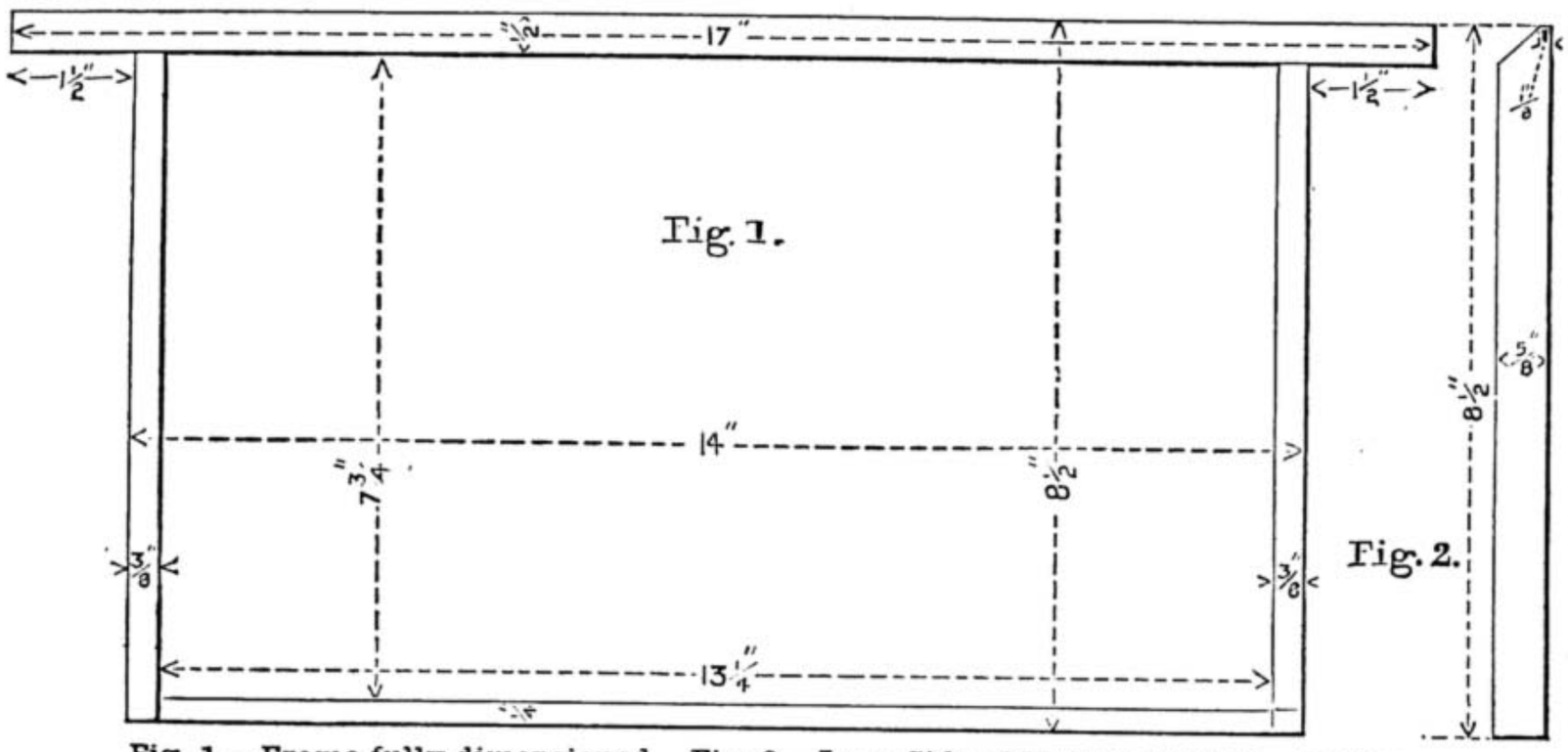

Fig. 1.

Fig. 2.

Fig. 1.—Frame fully dimensioned. Fig. 2.—Long Side of Makeshift Hive: section.

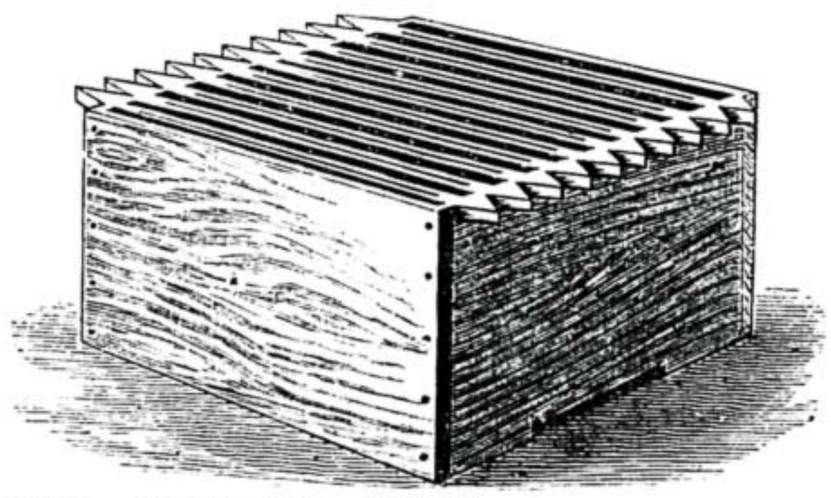

Fig. 4.—Abbott's Makeshift Hive shown with Frames, but without Stops for Ends: the Door is inside.

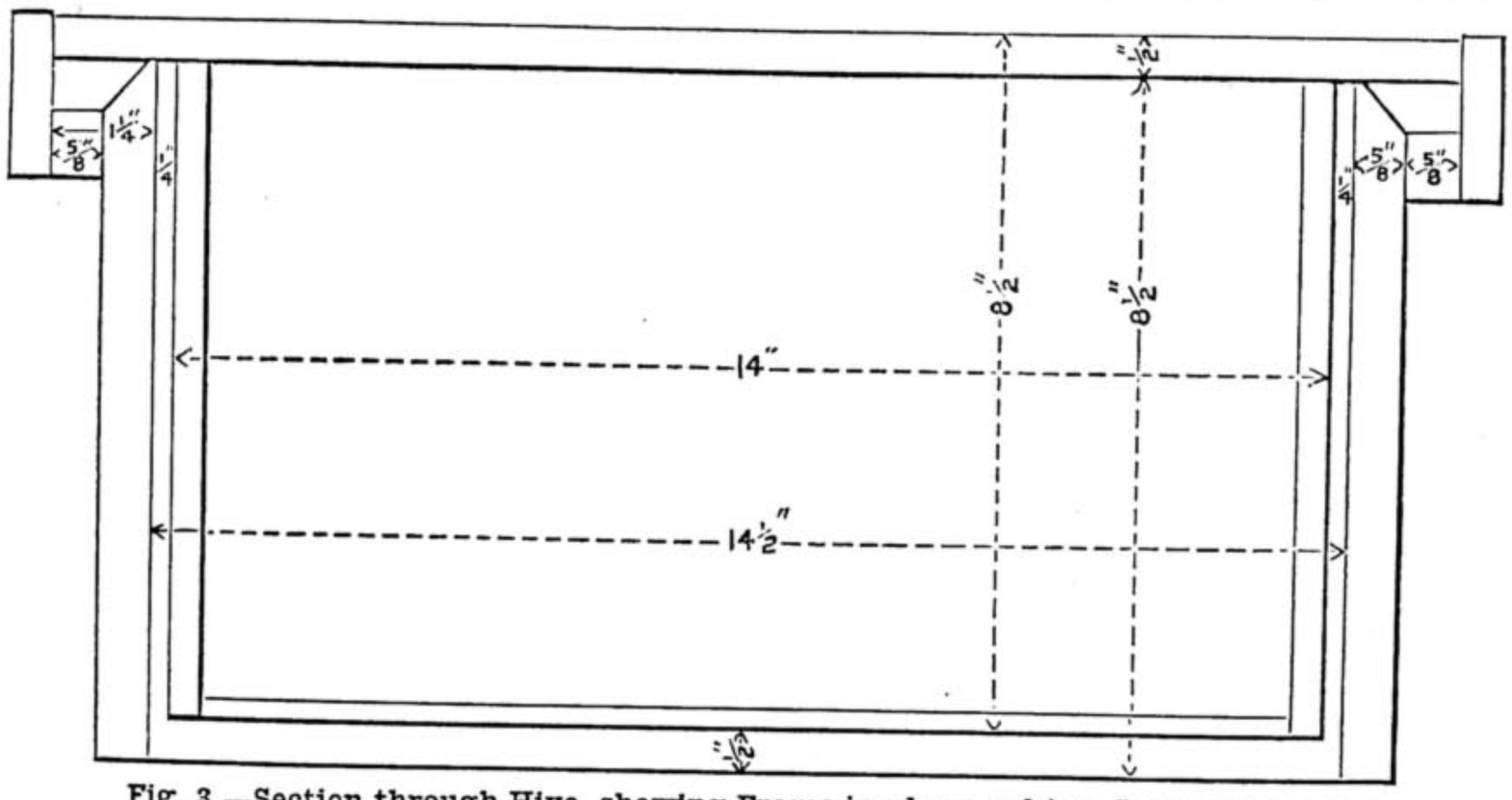

Fig. 3.—Section through Hive, showing Frame in place and two Stops for Top Bar.

od practice to anoint the ends of
with white lead before they are
as it preserves the wood, and
joint almost air-tight. The box
be laid on a perfectly flat sur-
ked at across the top edges, to
it is in winding, and if not, the remaining nails, four or five at each corner, may be added.

As the inside width corresponds with the lines pencilled out, it will be 14½ in., just right to suit the frames. If the ends of the short pieces be now smoothed off on a level with the sides, the hive may be considered complete; but one thing is evidently wanting yet: there is nothing to prevent the frames from touching one side and being half an inch from the other side of the box. This is prevented by having stops at each end, as is shown in Fig. 3. For these stops the remaining piece of board will come in useful. The top bar is 3 in. longer than the frame. It, therefore, extends 1½ in. at each side of it, or 1¼ in. from the inner surface of the hive. As the side is ⅝ in. thick, it extends ⅝ in. outside the outside surface of the hive. Accordingly, a strip that thickness and an inch wide is nailed to the edge of the hive, and another, which may be any thickness, and about 2 in. wide, is nailed over that again, so that the end of the top bar abuts against it. This, at each side, will confine the top bar, and keep the frame in place exactly a quarter of an inch from each inner surface of the hive.

To any bee-keeper this hive is only a makeshift, as it is properly called, but it possesses over the ordinary skep the enormous advantage of movable combs, and the frames are of the standard size. It is supposed to sit on a board for a bottom, and to be covered with the quilt, with a board or waterproof cloth to keep out the rain. It would scarcely, however, be used for any length of time, its chief function being to hold a swarm until a proper hive was prepared.

I have not described how the frames can be made, postponing that to a later date. For the present the beginner might purchase half a dozen frames for a shilling, which will start him, and give him an idea of how they ought to look.

In my next paper I will show how to make a comfortable double-walled hive, with roof and all the necessities for a prosperous stock.

DESIGN FOR A CASE IN FRETWORK TO HOLD NUMBERS OF "WORK."

BY J. W. GLEESON-WHITE.

A READING-CASE to hold the current numbers of a serial work has many points that commend it to people who admire order. When WORK itself is cut open—not torn apart by that worst of all paper-cutters, an open and more or less grimy hand—it yields eight separate pieces, all betraying an impish tendency to crease themselves, tear themselves, grease themselves, and become generally dissipated and unlovely in appearance. Then some are apt to fall out, and even if not entirely lost, rarely again find their proper place in the ordered sequence of its pages. To those who frequently refer to "continued" articles, or are bidden to look at the columns of previous numbers for advice on the point under discussion, it is a great help to speedy reference if the rightful numerical order of the various pages is faithfully kept intact. Now, if the number be at once carefully cut and placed under an elastic string in a portfolio or reading-case specially prepared for it, not only can it be read with more pleasure, but the parts are kept clean and uncreased for subsequent binding into volumes. People who borrow odd numbers are the worst enemies of all both to books and their owners. For however the subscriber treats his purchase, it is nothing to the way loaned books suffer.

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To wreak the utmost indignities upon a borrowed magazine is a savage sport of otherwise irreproachable people. This, being a vice, is, as we said at the beginning of this article, naturally old enough to have become improved. In the "Philobiblion" of Richard de Bury (A.D. 1281-1345), he speaks of careless readers in the outspoken fashion of his day:—"You will, perhaps, see," he writes, "a stiff-necked youth lounging sluggishly in his study; while the frost pinches him in winter time, oppressed with cold, his watery nose drops, nor does he take the trouble to wipe it with his handkerchief till it has moistened the book beneath it with its vile dew." "He distributes innumerable straws in various places. He is not ashamed to eat fruit and cheese over an open book, and to transfer his empty cup from side to side over it; and because he has not his alms bag at hand, he leaves the rest of the fragments on his book." But to quote the ghastly picture the old Bishop of Durham sets forth is needless. In Morley's Shilling Library a reprint of his famous treatise is obtainable, yet those who are likely to buy

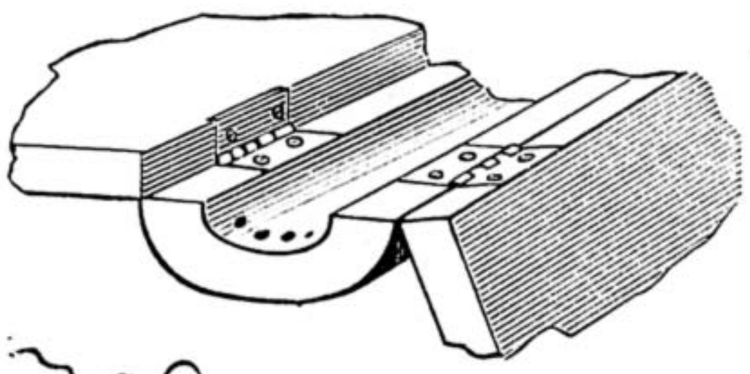

Fig. 2.—Construction of Back, showing Connection with sides.

Fig. 3.—Section of Back in Line of Perforations for Strings.

it will probably be the very ones who can read its scathing satire with innocent consciences.

But to return to the subject. In order to lend a helping hand to readers of WORK who buy their favourite serial in weekly numbers to keep it clean and without damage while in constant use at and after the date of publication, I have given in Fig. 1 a design for a suitable and appropriate case in fretwork, capable of holding several numbers, and this will be shortly followed by a companion design for a blotting-case, for the benefit of the numerous fret sawyers who have expressed a wish for such a design. In making covers for books, or blotting-cases with fretwork panels, the difficulty has been to construct a neat, yet strong, article. On an Indian blotting-case of sandal-wood inlaid with ivory and silver, I observed a rather clever adaptation of joinery to book binding that may commend itself to readers of WORK. Its covers were hinged to a solid piece of wood, grooved as in Fig. 2.

The back of this piece was rounded after the manner of a book; the whole middle of its back was that of the thickness of the two covers (plus the groove to receive the after contents), each plain surface at either side of the said groove being the exact thickness of the covers. The panels were hinged in the usual way (as shown in Fig. 2), and thus were as lasting as ordinary cabinet work. To keep the contents in place—in the one I saw the porous paper used for blotting was made into a book, and cemented to its place—elastic strings should be inserted. For a blotting-book, one such would suffice, but for a reading-case, four to eight would probably be needed. I should suggest holes drilled carefully (as in Fig. 3) at the top and bottom of the solid back. Then fine elastic might be secured, as there indicated, by means of the thin wire—known as flower wire—sold in penny reels. To pass the elastic itself through these holes is almost impossible, and appears clumsy, even if it can be managed, but to secure the loops of elastic with stitches (so to speak) of this fine wire is quite feasible.

Although the panel design that is given here, as well as that which is yet to be given, are, for obvious reasons, represented without the wide margin of plain wood, essential alike to their appearance and their stability, it must not be forgotten that the uncut border is an absolutely integral part of the scheme. Whether for blotting-case or a reading cover for current numbers, the case should be at least a trifle larger than the whole page of WORK: say an eighth to a quarter of an inch extra all round. The plan of making the blotting bookcase entirely of wood has been noticed above, but it will be as well to describe the usual methods.

In this case the panels are simply ornamental additions to an ordinary portfolio of card or millboard, with a joint of either leather or bookbinders' cloth. Full instructions to make these will be found on pages 138-9, Vol. I., of this periodical. For such a purpose it were best to choose very thin wood: either the thin "three-ply" sold for fret-cutters, or a home-made substitute formed of two or three layers of thick veneer arranged with the grains crossing each other. This substance, an eighth of an inch thick at the most, will be strong enough for all its requirements, and neither clumsy when made up nor difficult to saw. In such thin wood, at least two panels may be cut at one sawing, with average care to keep the saw blade perfectly vertical. A good method of securing a rigid substance is to paste a piece of thick paper on both sides, and lay it under pressure between the two panels. After it is cut, a thin-bladed knife will split the paper itself, while the portion adhering to the upper surface of the lower panel is easily removed by damping it. Although this cardboard foundation is much less sturdy than the alternative described above, it is much easier to make, and less clumsy when finished, and, for a blotting-book, pleasanter to use. I have blotting-cases made in this way that after ten years' use show little signs of wear, so in view of the transitory nature of fretwork generally it may be held sufficient. The panels should be applied to the portfolio (previously covered with a suitable texture to contrast well with the wood), and left to dry under heavy pressure.

As the alternative modes of manufacture have now been placed before the reader, the one being to the mind of the writer better suited for a receptacle for weekly numbers, and the other for a blotting-book, the would-be maker must now be left to take his choice in the matter of making.

The various processes of fret-cutting, finishing, and the making of the portfolios themselves, being already amply discussed in these pages, it will suffice to refer possible workers to Vol. I. for any details that are by chance or design omitted here.

For all purposes such as these, where fretwork is to be handled frequently and liable to close examination, it should be neatly finished, and the rough saw cuts polished smooth with a small file.

The whole cover should be lined with silk or paper. While the colour is a matter of choice, yet for blotting-books, black staining, with a subsequent polish, is obviously the most suitable. The letters might in either case be gilded if the taste of the maker prefers them to be made more apparent.

In place of a drawing of the finished case, for which room could ill be spared, it is hard to give an idea of its finished effect, but that it is pleasant enough I can vouch by actual experience.

OUR GUIDE TO GOOD THINGS.

*** Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of WORK for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of any one who has a useful article for sale to obtain mention of it in this department of WORK without charge, the notices given partake in no way of the nature of advertisements.*

1.—CHURCH'S WALL DECORATOR.

I WISH for a few moments to call the attention of the readers of WORK to the article and illustrations with which this, the first number of the second volume, is commenced. The paper is descriptive of a new process for the decoration of the surfaces of walls and wood, and the engravings by which it is accompanied exhibit very clearly some of the varied effects that may be produced. It is aptly entitled "The Wall Decoration of the Future," and so it undoubtedly is, by reason of its cheapness, the rapidity with which it can be done, and the beauty of its appearance when finished, satisfying the eye in every respect by the forms with which the surface is diversified and the colours with which it is endued, ranging from a delicacy of tint to a richness and depth of tone that cannot be surpassed by any other preparation in the form of a pigment. The writer of the article has told his readers what it is, and how the work is done, and it remains for me merely to say that I have seen a house in the south of London decorated by the process from cellar to attic, and that I was, in every way, impressed and satisfied with what I saw. With regard to its cost, the painter who was at work in the house told me that a room in which we were standing—to paint which in oil colour would have cost about £2—had been done in the course of about six hours, the material used costing about 10d. Further, he took a piece of wood about 3 ft. long and 15 in. wide, and in ten minutes he had mixed the material necessary for the work, painted the panel, and combed the surface with a graining-comb, producing a corrugated appearance, rich in effects of light and shade. Further, he had only been acquainted with the process for three weeks, and yet had attained sufficient facility in its use to work with the confidence and rapidity that he then exhibited. No amateur workman can fail to carry it out well, much less any professional worker in paint or plaster; and I trust I have now said enough to occasion readers in every town of the United Kingdom to apply to "The Church Manufacturing Company," 127, Pomeroy Street, Hatcham, S.E., for specimens of the colours employed and sample tins of the "Wall Decorator," or the cheaper "Alabastine," and to try them for themselves under the instructions conveyed in the article to which I have already made reference. I trust it may prove the means of making many a workman's dwelling more attractive as a home, by the triple charm of colour, cleanliness, and help towards better sanitation.

2.—THE BRITANNIA COMPANY'S PATENT DOVETAILING MACHINE.

In the first volume of this magazine I was enabled, by the courtesy of the Britannia Company, to call attention to their powerful patent saw, and to give a brief description of it, with an

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illustration. I am now further permitted to call the attention of my readers to a simple but highly efficient appliance for dovetailing, known as the "Britannia Company's Patent Dovetailing Machine," which is illustrated in Figs. 1, 2, and 3, given herewith, the nature and the work done by its aid being further shown in Fig. 4. Every workman who has been accustomed to cut dovetailing well knows the care and accuracy that are required to ensure perfect work, and how much the time taken up in its performance must be abridged by the use of machinery capable of producing the same result, and that in shops where much of this kind of work is done, the cost of it must be considerably reduced, when it is said that an apparatus of ordinary size, as shown in the illustration, is supplied by the Britannia Company, Colchester, for £2 2s. I will now proceed to give the Company's description of the machine itself, and the method of dovetailing by its aid:—"First, fit a well-seasoned pine board about 24 in. by 18 in. and ¾ in. thick, strengthened with clamps at each end, upon the saw-table, with a mahogany spline fitting the groove in

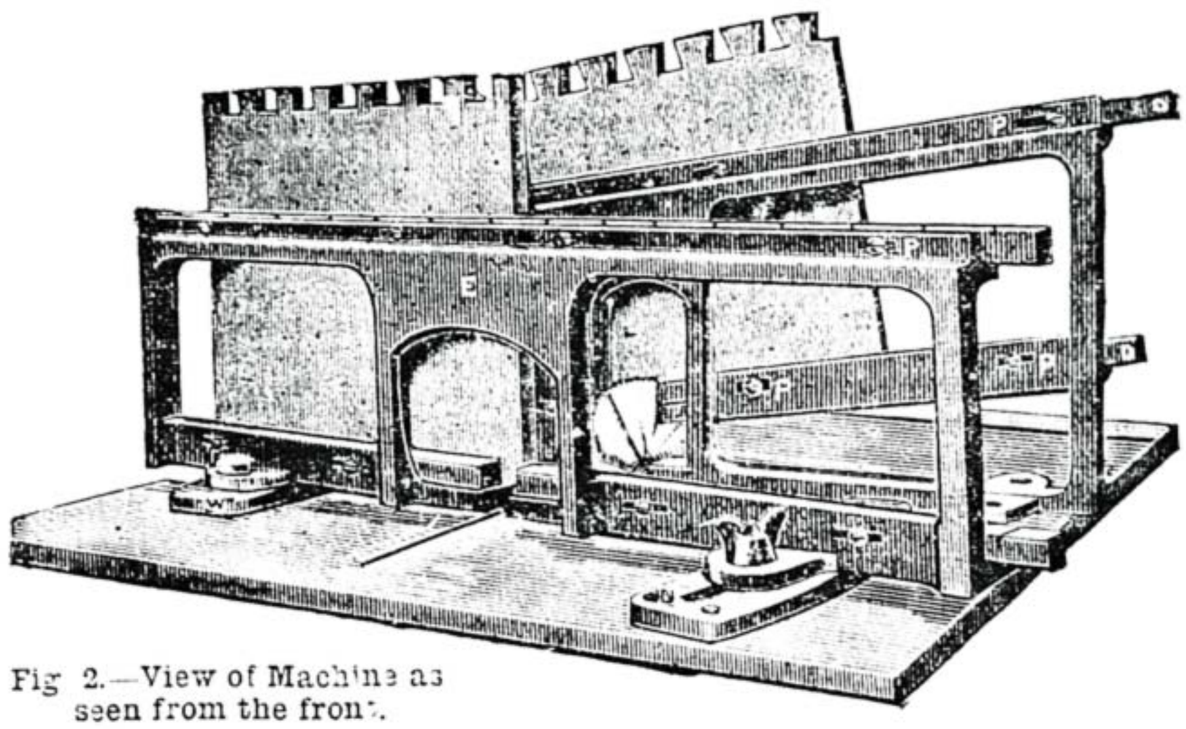

Fig 2.—View of Machine as seen from the front.

Fig. 1.—Patent Saw with Dovetailing Machine on Saw-Table and in use.

your saw-table, ensuring an accurate movement, with a slot exactly in the centre of the two frames when in their places, for the saw to work through, as shown in Fig. 1. Fix on the gauge, D (Fig. 3)—which is a piece of wood with slots at intervals, according to the size of dovetails required—upon platform, F (Fig. 2), of frames, as shown. These gauges are generally fixed upon the lower ledge, but for some work the upper ledge may be more convenient. A set of these gauges can easily be made by any amateur, or are supplied with the dovetailer. The appliance W (Fig. 2) is to be fixed upon the board as shown, so that the saw may run clear when the movable frame is at either end of the segment. Put in the screw at W through the frame, E (Fig. 2), and screw down, so as to allow the frame, E, to move backward and forward. The frame, S, is to be fixed, as shown, 2¼ in. from square line of saw. To cut the mortises, place the wood upon the inclined plane, having adjusted the table so that the saw will cut the correct depth. Bring the front edge of wood up to the end of the gauge, holding the marker in the left hand so that it falls into the various slots as the wood passes up the incline." The positions of the operator, the movable table, the frames, gauges, inclined plane, wood, marker, and saw are all very clearly indicated in Fig. 1.

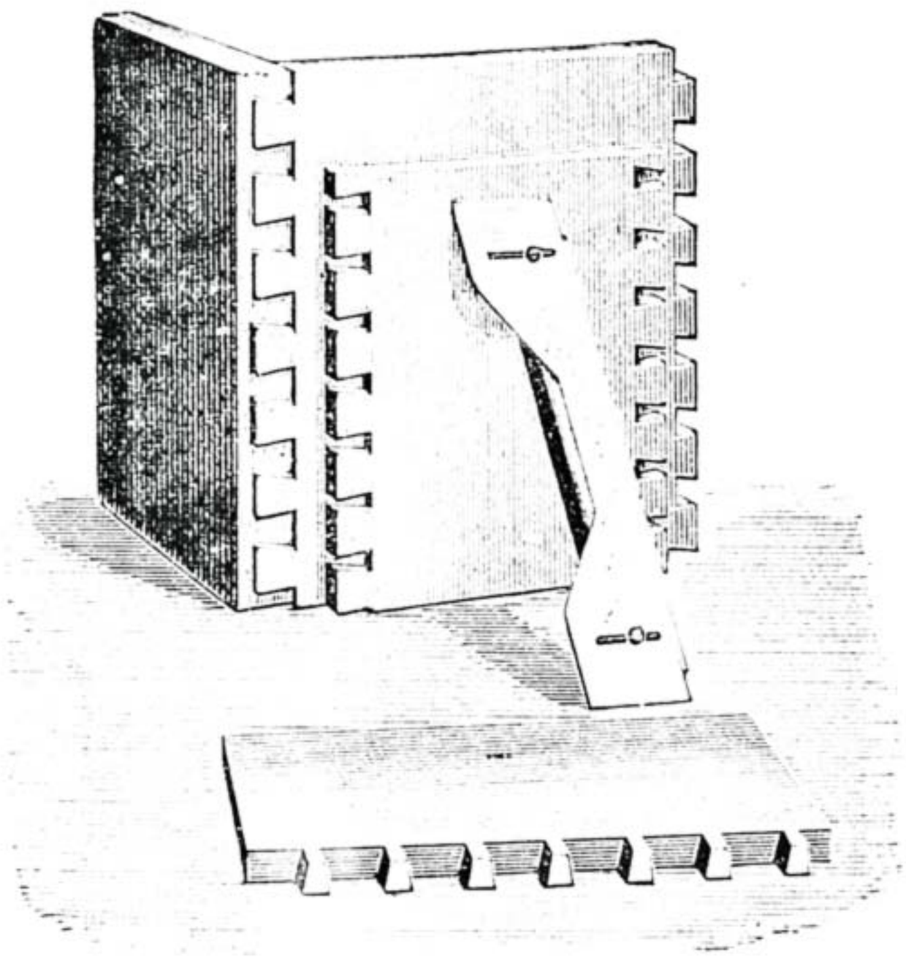

Fig. 4.—Examples of Dovetailing done by Machine.

"When one row of cuts has been made, turn the wood round and take the marker in the right hand and follow each cut up the incline until the cuts are completed. To cut the tenons or pins, adjust the saw-table so that the saw cuts the required depth. Fix the gauge, D, on the lower ledge of platform, E, the inner end of gauge forming the distance for the first cut." Of course, it will be understood that the cuts only are made

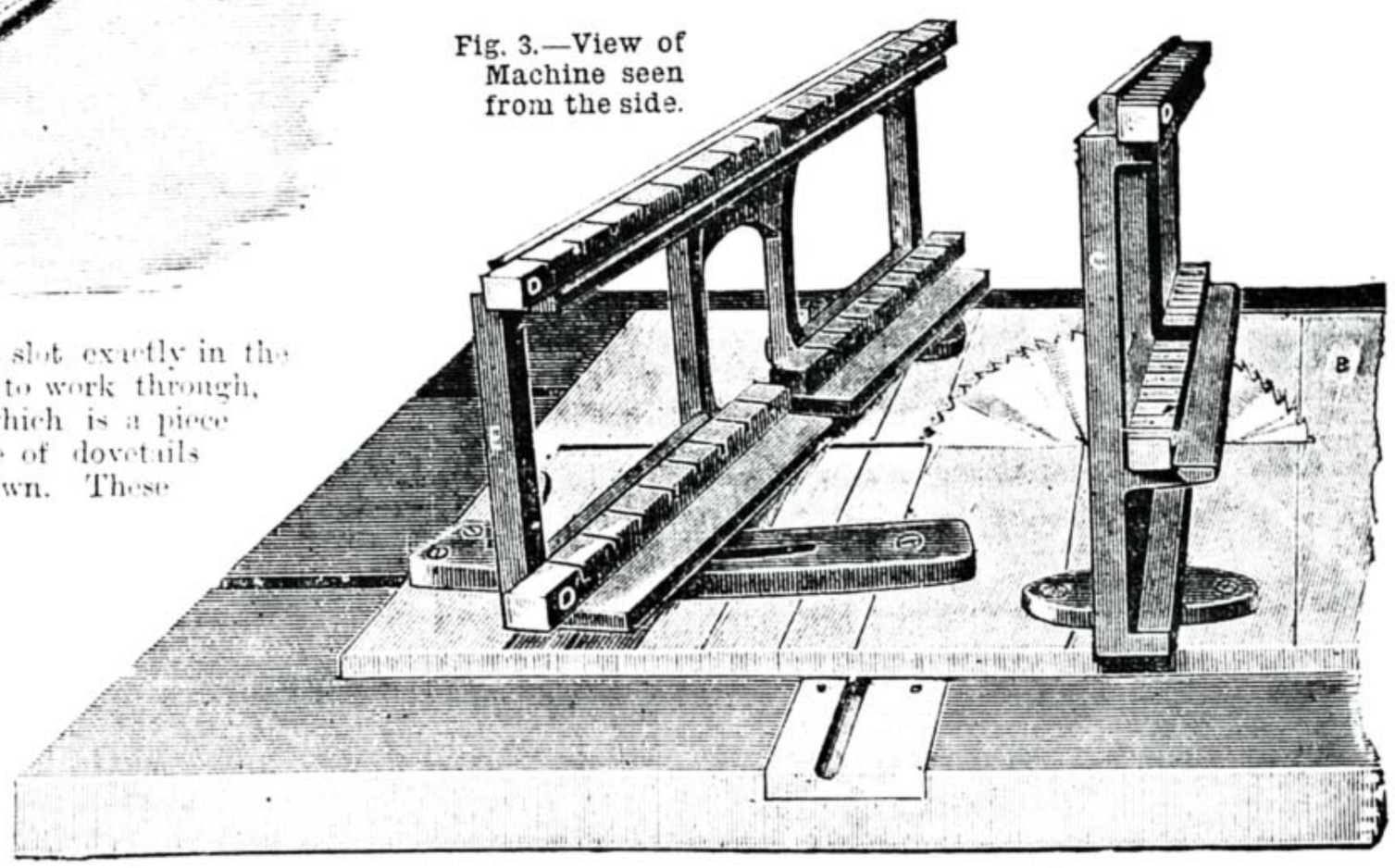

Fig. 3.—View of Machine seen from the side.

by the saw. The clearance of the mortises and the wood intervening between the pins must be effected in the usual manner with a chisel. The merit of the entire appliance lies in the presentation of the edges of the wood to the saw in such a manner and in such a position that the saw kerfs, first in one direction and then in the other, are made with such sure and certain regularity of distance and direction, and perfect parallelism, that an operator who is comparatively an unskilled hand can be enabled to perform work which, if done by the hand, must be the outcome of long practice combined with the utmost care in execution. THE EDITOR.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

NOTICE TO CORRESPONDENTS.

*** In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—LETTERS FROM CORRESPONDENTS.

Saw Hammering.—T. O. (*Bootle*) writes to J. N. (*Sheffield*):—"I am very thankful for your kind offer on page 715, Vol. I. Regarding my late questions in WORK about saw hammering, I should like to know how to hammer a buckle and a twist from a hand-saw, and the description of the hammers for the job, and their weight. I might say I have an anvil, or, properly speaking, a hammerer's anvil. Please describe the different effect the various hammers have on the plate or on the saw."

Band Saws.—A. X. E. (*Nottingham*) writes:—"I have read the letters of A. R. (*Scorrier*) on brazing band saws in 'Shop,' but I think I have the advantage with Duncan's machine. Of course I have to use gas and he uses charcoal, etc. C. D. Moninger, St. Anne Works, Clerkenwell, makes a similar machine to Duncan's, but I have had no experience of it. Moninger's band saws I have used, and I can recommend them as being of good quality."

Varnishes.—G. W. D. (*Ventnor*) sends the following recipes in varnishes:—"*A fine clear varnish.*—Dissolve gum mastic with spirits of wine to the thickness required. Another fine clear varnish is made by dissolving gum mastic (bruised) in spirits of wine; thin down to the thickness required with Venice turpentine; strain. *A transparent varnish.*—Gum sandarach dissolved in spirits of wine; add Strasburg turpentine to the thickness required for use; strain. *A paper varnish.*—Venice turpentine dissolved to the thickness required with spirits of turpentine; strain. *A white varnish for water-colour drawing, maps, etc.*—Canada balsam dissolved with not quite the same quantity of Venice turpentine; strain. *Cabinet varnish.*—A fine clear varnish. 3½ oz. of gum mastic well dissolved with 1 pint of naphtha, and strained through muslin. *A useful varnish.*—2 oz. of gum seedlac, well diluted to the thickness required. Strain through fine muslin. *A varnish once used wanted again.*—Steep well together a pint of methylated spirits in alkanet root, shellac, 2 oz.; gum benzoin, 2 oz.; gum thus, 2 oz. Dissolve these gums well together with the spirits by gentle heat, and strain through muslin."

A Useful Size for Water Colours, Maps, Print, etc.—G. W. D. (*Ventnor*) sends the following:—"Isinglass or gelatine, well boiled down, is useful, but parchment shaving, well boiled down and strained, when cold should be a thin jelly. *To prepare water colours for varnishing.*—With flat camel-hair brush lightly stroke through once, beginning at the top and working downward. When perfectly dry, another coat, working your brush more freely; when dry, if you give it the third, your work will be attended with better results. The same brush, washed out and dried, will answer all purposes."

A Paste to Keep from Souring.—G. W. D. (*Ventnor*) recommends sugar of lead. "Corrosive of sublimate was formerly introduced with paste when called on to repaper our old thatched houses, covered with ivy, etc., which give such refuge to insects and other vermin, as a preventive against them. Both being acids may assist to preserve; but both are poisons. Well dissolve a spoonful of alum (powdered) with small quantity of boiling water; allow this to cool. Mix this with a tablespoonful—more of each, if required—of flour into a well-beaten batter. Slowly pour boiling water, stirring till it turns. If not successful, small quantity of cold water in saucepan to keep from burning your paste, which slowly heat, stirring all the time until it becomes stiff. You will then have a paste that will keep from souring."

Folding Chair Rivets.—To. Po. writes:—"If CABINET MAKER (*Rawtenstall*) has any difficulty in getting his folding chair rivets and washers (proper bright and smooth ones, that will not rust or cut the wood so easily), if he will write to me (care of Editor), I shall be pleased to help him, knowing from actual experience how hard it is to get them, as many shops do not keep the kind, even near where the folding chairs are made in thousands. The rivets are about 3d. per lb.; washers 1½d. to 3d. per gross, according to size and weight. I have mislaid the exact address, but expect to be in the neighbourhood again soon; I will take note. If 2 in. clear of head will do him, I could spare 3 or 4 lbs. or so, but they are just slightly rusting, being kept in a damp place."

Treatment of Cuts.—J. C. K. (*London, N.W.*) writes:—"MEDICUS seems to have overlooked the distinct statement that the treatment of cuts by French polish, and using pins to close the wounds, was offered as the best in cases of emergency. Glue, of which MEDICUS speaks as if it had been proposed by me, is, of course, to be condemned as likely to lead to blood-poisoning. He gives the regular course of hospital procedure: admirable, but not always available. Forty years is my long experience in cases of serious accidents, and their treatment when far away from a hospital. When near one, I have sent the men there to have their wounds dressed. Let some one who has suffered by the treatment named for emergent cases speak for himself, as to the harm or good resulting from the treatment which MEDICUS calls 'bad.'"

Printers' Ink.—PARAFFIN (*Cardiff*) writes:—"In WORK, page 715, Vol. I., appears some very strong remarks from M. D. C., in reply to a statement of H. L. B., about thinning down printers' ink with paraffin. If M. D. C. cannot understand how to mix the two articles together so as to be able to use the mixture, it is a great pity that he should sneer at one who knows more than himself. Allow me, sir, to say, as a working printer, that for years past I have never used anything else than paraffin for thinning down my ink. On a cold, frosty morning, when the rollers and ink slab are as hard and smooth as the ice outside, a drop or two of paraffin on the slab puts all right, and in five minutes I am able to run the machine. If I want to turn out a poster quickly, and so that the ink shall not stick one sheet to another, a few drops of paraffin is the very best drier I can get. If I have a job of colour work, with ink so stiff that the brayer will break almost before moving it, paraffin cures the difficulty. In fact, sir, I consider that the use of paraffin gives me about six or eight hours per week more working time. As regards poster writing, I am not a practical hand at that, but the principal poster writer in this town, a man who writes twelve to fourteen sheet bills for the theatres, etc., always fetches away our empty ink tins of all colours, and mixes the remains with paraffin until he has it so thin that it is almost as liquid as the paraffin itself, and he uses nothing else with it, whilst his written posters are the talk of the town. He tells me that nothing beats printers' ink well mixed with paraffin for poster writing. M. D. C. asks what to mix with printers' ink to keep it from working stickier or leaving brush marks. I reply—paraffin."

Copying Fretwork Patterns.—FRED (*Camberwell*) writes:—"I have hit upon a plan I think is very simple, and, what is more, you can make as many copies as you like. Take a piece of an old round blind-roller, and glue two or three thicknesses of cloth round it, and put a long nail in each end, which serves as a handle. You now want ink; this you can make with lampblack and size mixed together to thickness of a thin paste. Put a little of your ink on a slab and roll your roller over it, so as to get the cloth covered with ink. When this is done, roll it over the piece of fretwork you have cut out and lay a piece of paper on it and rub it over lightly, and you have an exact copy. You can take off three or four with once inking the pattern. I have done this for some months, and find it very satisfactory."

About WORK.—H. A. B. (*Tunbridge*) writes:—"For the encouragement of others, not only to buy WORK but also to carefully peruse it from beginning to end, let me state how it came unexpectedly to my assistance when I wished to help a young friend to make an electroscope. Every one who does not know how to handle gold leaf finds a difficulty in doing so; when you cut it, it sticks to the scissors; when you touch it, it sticks to your fingers, it crumples up, it twists about and goes everywhere but where you want it to. Such was the experience of my young friend, and he turned to me for advice. I immediately looked to my text books and found the usual instructions how to make an electroscope: 'fasten two strips of gold leaf,' etc., but no instructions how to manipulate the gold leaf. But I was certain I had read somewhere what I wanted to know, so I turned back to the early numbers of WORK, and at last came to No. 8, and on page 118, Vol., I I found what I was in search of, 'Gold Leaf and How to Use It.' Although it refers to gilding picture frames, etc., yet I found what was lacking in my electrical text books, and was able to help my young friend over his difficulty. Had I only read, as some do, what concerns my trade, I should have lost what was at the moment most useful information. So I would say to all workers, do not turn away from WORK, even if you do not find it touches upon your particular branch of the trade, for you may find as I did—useful information in a tip given for a trade which has little in common with your own."

Wire Thread Fret Saws.—W. E. C. (*Wakefield*) writes:—"I have been a subscriber to WORK from the first, and I am very much interested in fretwork, therefore have noted the inquiries from time to time about the new wire fret saws. As soon as I saw your notice in WORK I sent off at once to one of the persons mentioned for a sample dozen (7d.). I received them in due course, and the tradesman from whom I got them kindly intimated in his letter that if they did not give satisfaction he would exchange them for something else, but I am afraid that if I sent them to him now he would object to do so. I have given them a fair and diligent and careful trial, and am now strongly of opinion that both the saws and the idea of the principle on which they are made are worthless, and I find that it is simply impossible to cut fine and delicate work with them. I took the trouble last night to cut you two samples of fretwork, which I enclose for your opinion. The panel on the right-hand side is cut with the new wire thread saw (No. 2), and that on the left with a No. 2 Star saw, and I think you will see there is no comparison in the quality of the two samples sent. I have sent all the waste in the recesses just as cut, so that you can better judge the work; and in doing the small bit of fret that I send you I broke no less than six of the new wire saws, but the other (Star saw) was no worse. I cut the sample with a machine on the principle of the Britannia Company No. 8 machine. I bought part of the castings and the working parts from them, and then made the machine myself. I enclose you photos of the machine, whereby you will see I have made great changes in their machine, and improved it in several parts. In the first place, I cut all the castings, etc., away from the front of the saw, so as to leave a clear course for getting the saws in and out; made the table on an entirely different principle; reversed the tightening screw from bottom to top; at far end of saw I made a new cam and driver; and gave the saw a much longer stroke and several smaller improvements. And I have no hesitation in saying that there is no machine in the market to equal it in freedom of working, ease in running, and the quality of its work. I omitted to say that the saws are too thick, which would prevent fine work being done with them, and that they are liable to run to either side in cutting." [It is clear from your experience and specimen of fret cutting sent that the ordinary fret saws are better for fret cutting than the wire thread fret saws, for the reason that the former cut in one direction only, the latter rasping the wood away on either side of the saw as it goes through it, as well as making the saw cut. Your adaptation of the fret machine appears from the photos sent to be ingenious and useful. I cannot engrave them, but if you like to write a paper on approval, showing the improvements you have made, with illustrative diagrams, I will consider it with a view to publication.—ED.]

Saw Hammering.—J. W. W. (*Hull*) writes:—"I see on page 715, Vol. I., that J. N. (*Sheffield*) promises to give any information on saw hammering that any of us would like. I am a circular sawyer by trade, but got lamed last June, and now having got to work, they (our firm) have given me the job of saw sharpening. But the difficulty is how to hammer the saws when they are not true, or have black eyes in them, for if I hit the saw where the lump may be, I throw the saw out in another place. I have made every inquiry as to the whereabouts of getting the information I require, but the saw hammerers will not tell me, they thinking that it would be taking a living out of their hands. Will J. N. kindly help me?"

Preparation of Artist's Canvas.—AN AMATEUR ARTIST writes:—"Several of your subscribers ask how to prepare canvas for painting on. The following is a method I have used for years, and find it answers well. It is quite as durable as that prepared by colourmen and much cheaper. Take a piece, say a yard, of any sort of canvas. You can get it from 3d. per yard. Stretch it tight on a rough strong frame. I keep one on purpose. Small tacks will fasten it on. Put it on just smooth at first, and tighten it up by drawing one tack at a time, and tightening up till you can stretch it no more. I use pliers to remove the tacks, and to draw the canvas tight. When done, size the one side with thin glue or patent size. Put it on the same side as the frame, but do not let the size go under the frame, or it will stick it down. This causes a little waste round the edges, but not much. Let this dry hard. Take a lump of bees-wax and well rub over the surface over the size. Let every part be gone over. Lay the frame on a level board or table with a piece of woollen cloth or ironing blanket underneath. Have a smoothing iron made hot enough to smooth, but not burn. Place this down gently at first, or it will stick, but when the wax melts the iron will run smoothly over the surface. Rub it over till quite smooth. All lumps or unevenness in the canvas will be pressed into the other side. It should now be even as a shirt collar. Take white lead, well thinned with turps and toned with ochre or umber, and paint the surface over. If the lead be lumpy or skinny, strain it. When dry you will have a surface to paint on equal to anything you can buy. Of course you cut it off the old frame, and refix it, the right side out, to a new frame."

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Casting in Brass.—BRASS (*Wolverhampton*) writes:—"H. B. (*Jarrow-on-Tyne*) (page 779, Vol. I.) asks some one to get him a casting in brass from a mahogany pattern which he has made. I shall be pleased to do so for him if he will forward the pattern to me. He does not say if he requires it finished in any manner: I presume he will do that himself; if not, and he will say how he wants it done, I will try and do it for him. As the casting is for making an impression upon the back of a book, it will, I think, only want filling up smooth and level."

Dulcimer Making.—F. K. (*Hinckley*) writes:—"I should be much obliged if you would allow me to make a few suggestions for those intending to make a dulcimer. An amateur will find that if he does not get all his tuning pegs and hitch pins accurate, the work looks slovenly. Also he will find great difficulty in tuning. It is hard to tune one string to two notes; it is harder to get the four in unison to two notes. I should suggest that instead of separate bridges one long bridge of ¾ in. beech be used, perforated same as inside bridges with smaller holes—distance can easily be measured—to allow the strings to pass through, instead of

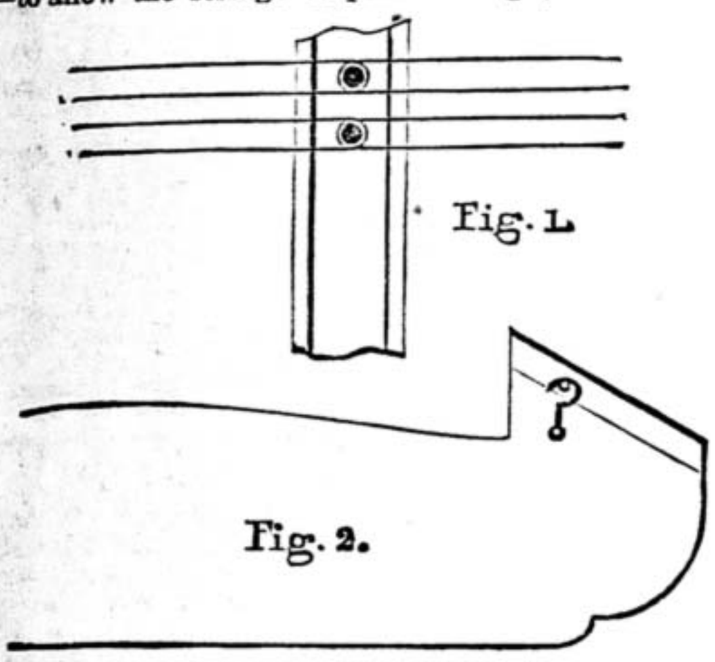


Fig. 1.

Fig. 2.

Dulcimer Stringing.

the strings passing straight over. Hitch pins should be driven in the centre of the bridge, the strings from each side simply passed round the pin, and tuning pegs on each side of the instrument, as in Fig. 1. Brass wire is to be put down each side of the bridge, same as blocks. Two pins will be sufficient for four strings. This is for the left-hand bridge; it is immaterial for the right-hand, but the strings passing over this should be tuned from left-hand side. I would also suggest that the facing of the dulcimer (Fig. 7, page 597, Vol. I.) should be left higher at the sides—just a little higher than the tuning pegs. A strip should be screwed on the side of the blocks and a lid hinged to this to cover the blocks, thus hiding any irregularities. This will save veneering and polishing the blocks. Facing and lids can be made of any fancy woods, carved or inlaid to suit fancy. Back facing to be left same as front facing."

Invalid's Bed Tray.—W. R. E. (*Lanarth*) writes:—"Enclosed you will find a sketch for invalid's bed tray. It has been proved by friends of mine to be very useful. It might prove so to a good many readers of WORK."

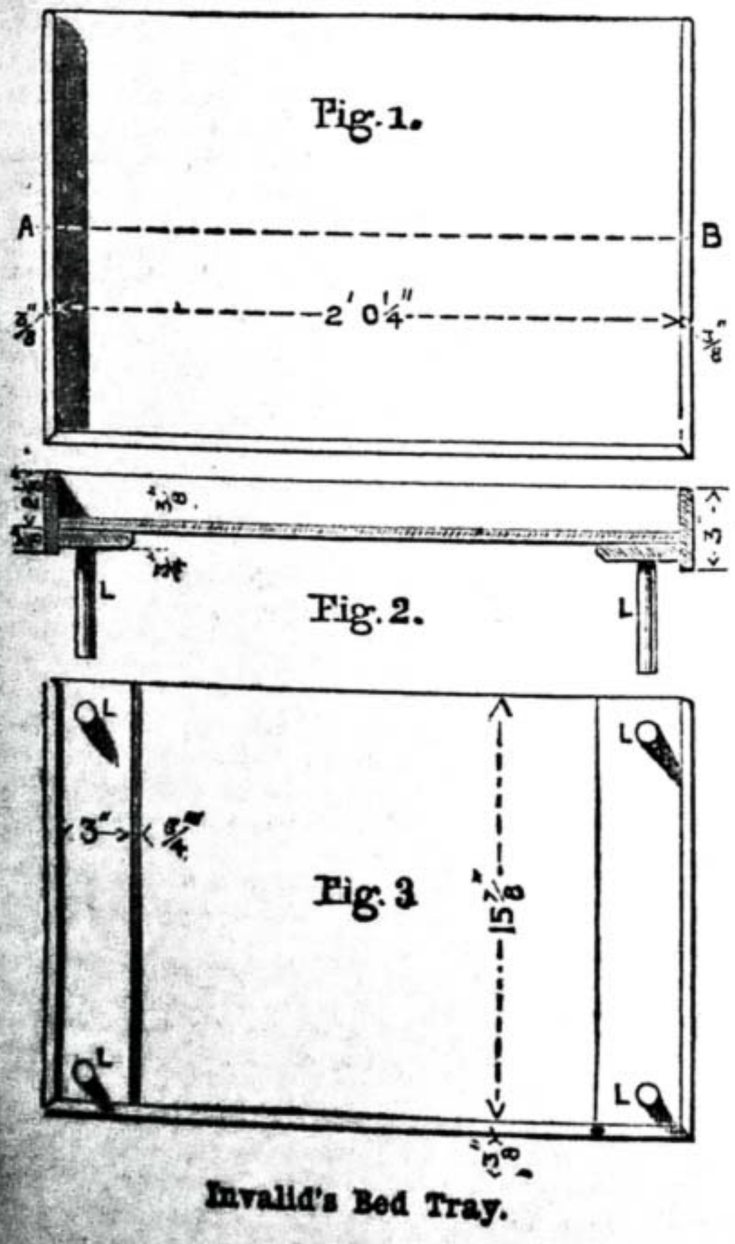


Fig. 1.

Fig. 2.

Fig. 3

Invalid's Bed Tray.

An Easily-Made Fret Machine.—W. R. S. (*Brixton*) writes, in reply to EAST WINDOW (*Stockport*) (see page 716, Vol. I.):—"You ask me to explain what I mean by saying that the throw of the machine will be double the distance from centre to centre of the piece marked C. This is a mistake of mine, and for which I beg to apologise. I should have said, the throw of the machine will be double the distance that the bottom of the piece marked C is placed from the centre of the wheel."

An Easily-Made Fret Machine.—W. R. S. (*Brixton*) writes:—"In No. 47 of WORK, page 747, Vol. I., F. D. (*Luton*) says that the claims advanced for the above were in his opinion all false. The claims are that it has a vertical stroke, is easily constructed, and that it can be made for a few shillings. He then goes on to say that his machine has a just claim to the above recommendations, and that it gives a perfectly vertical stroke. I am very much obliged to F. D. for specifying his machine as though it were a great improvement on mine, when in point of fact it is an exact copy of mine, with the exception of the treadle, which, while being the only part that is original, is not at all suitable, as it is not sufficiently under the control of the operator. The claims I put forward are justified. My machine has a perfectly vertical stroke. F. D. says that his machine has one also: this is quite true, being a copy of mine; so much for his assertion that mine has not a vertical stroke. My machine can be constructed by any person of ordinary ability, and who is able to handle a few tools, and it can be made for a few shillings; in fact, the cost of mine was about 4s. 6d. I do not care to waste my time by replying to letters such as that of F. D., but I shall always be happy to give any information which is genuinely asked for. I may add that several people have called to see my machine, and I am prepared to show it to any one who cares to call at my address, which the Editor has."

Portable Electric Lamps.—The Britannia Company write:—"We have some of these, and are making an apparatus—dynamo and foot power, to charge them—without the mess of a battery."

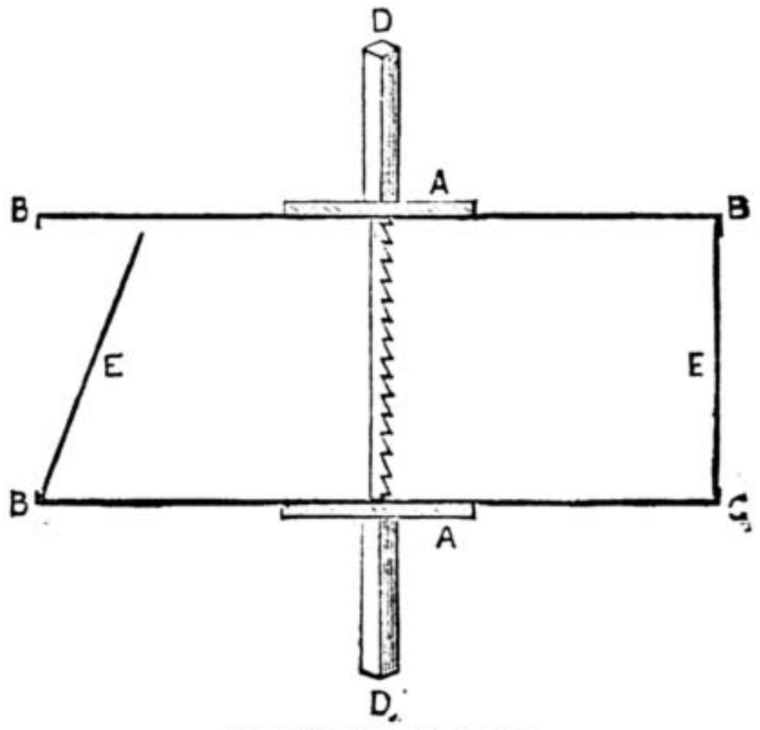
Boots and Shoes.—H. G. (*Bishopsgate*) writes, in answer to G. R. (see page 715, Vol. I.):—"I must say that his idea of boot and shoe making must be very vague; he wants me to answer a dozen items in 'Shop,' each one embracing a different branch of the trade. If he does not know how to build 1½ heel or round an innersole, I am sure he cannot make a wide welt, hand-stitched, or turn a shoe inside out, not if I described how it is done. I should advise G. R. to be a laster instead of a bootman—that is, making men's and women's boots on iron lasts—which is much easier to learn. Three parts of the boots and shoes that are made and sold in the United Kingdom are made on iron lasts, the prices ranging from 1s. 6d. to 50s. I am sorry I cannot tell him how to commence, as it would take up too much space in 'Shop.' You can buy men's and women's uppers of all descriptions, from 2s. upwards, from Nappir or Andrew, in Whitechapel Road; or Carter, Kingsland Road; or Beasley, Wilson Street, Finsbury, so I don't think it worth your while to try and cut them yourself."

Simple Incubators.—R. S. (*Withington*) writes:—"Like several of your correspondents, I a manxious to learn more respecting the 'Simple Incubator' that W. L. in page 557, Vol. I., writes about. I have experimented in making a simple incubator, and consequently I am not so puzzled about it as some of your readers seem to be. I procured an old bacon box from a grocer for a shilling. The top had been broken up, so I turned the box bottom upwards. I then made one end to take out, so as to act as a door. I placed this in a spare bedroom, put the pots inside as directed, and commenced work. The lamp used was an ordinary paraffin lamp, of tin. The thermometer was placed between the flannels where the eggs were supposed to be. The heat aimed at—103 degrees Fahrenheit. After two or three days' trial, I found that the apparatus would work with just moderate variations in the heat. One important point is that the lamp must not be too near the top pot or it will not burn well. If the apparatus were accurately constructed, I believe that no hot air should escape between the two pots, but after spreading itself over the bottom of the top pot, should find its escape under the lower edge of the bottom pot. The greatest defect seems to be the want of a regulator, and there is a very serious omission—there is no provision for moistening the eggs while hatching. Possibly W. L. believes that eggs will hatch all right without the moisture. I belong to the opposite school. If W. L. or any of your readers will explain how to make a regulator for the 'Simple Incubator,' and how to keep the eggs moist, he will confer a boon on many an amateur operator in hatching."

Steatite Burners.—F. B. (*London, E.C.*) writes:—"Allow me to supplement a few remarks in 'Shop' (see page 789, Vol. I.) regarding steatite burners. Messrs. William Sugg & Co., Limited, Westminster, are manufacturers of steatite burners. If H. W. L. (*Ealing*) requires lump steatite in larger quantities, I can offer same to advantage, being agent for a German pit owner."

Painting Magic Lantern Slides.—F. B. (*London, E.C.*) writes in reply to P. M. C. (*Finsbury Park*):—"The Silicine glass painting process offers several advantages as compared with the method described by OPIFEX. The glass does not require any special preparation before beginning to paint, while shades may be put in or several tints laid over each other, as soon as the underlying surface has become perfectly dry."

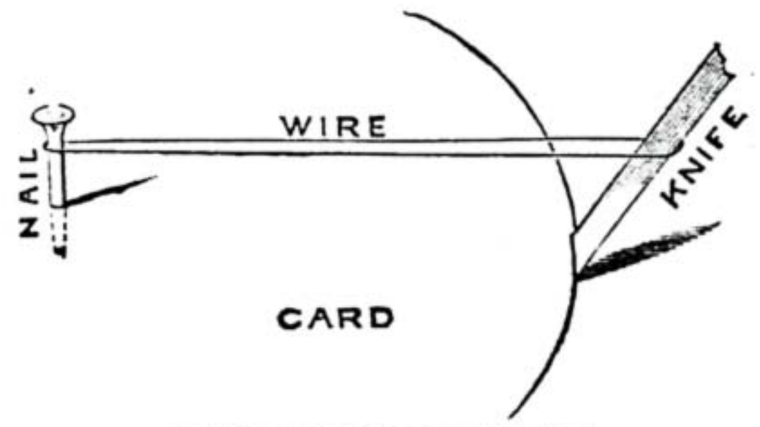
Useful Scroll Saw.—ARTIST IN WOOD writes in reply to VERDANT (see WORK, December 29, 1889):—"The size of fly wheel is 19 in., weight about 40 lb., thickness of shaft ⅝ in. if made of steel; if of iron ¾ in. Crank 2 in. from centre of shaft to centre of pin. That will give 4 in. stroke to the saw; it may be made to give a stroke of 4½ in. Length of irons for slides to work in 3 in.; length of slides 11 in. The slides are slit with a saw made for cutting iron, the same as a common bow-saw handle, and a bit of wire $\frac{3}{32}$ in. put through slide and saw blade to fix it. The frame is made to take down quickly for inside work. Top and bottom 3 ft. 2 in. long, 3 ft. 1 in. thick, side long enough to bend top and bottom woods, and so strain the saw. The saw blade is 16 in. long, ¾ in. wide, ground thin at the back. Groves' make of saws are the best I have used. They cost 7s. per dozen. A A are pieces of inch wood to strengthen the frame and receive ends of slides. A washer is put in at the joint for end of



Useful Scroll Saw.

slide to rest on. B, bit of iron or tin 5 in. bent and made fast on end of top and bottom woods to keep the stretcher woods in their place. D, D, slides; C, joint made fast; E, E, stretchers."

Cutting Circles out of Cardboard.—A CONSTANT READER (*London, W.*) writes:—"Will the Editor of WORK or any correspondent inform me how to cut circles out of cardboard? Is there any machine made to cut them various sizes, such as a cheap horizontal compass with a movable cutter? I have been told of a washer-cutter, but this machine is too clumsy, and also too expensive. What I require is a fixed centre that does not move, so as to make the hole in the centre of the circumference so large that the true centre is lost in cutting a second circle out of the same piece of cardboard. I have tried ordinary compasses, but these do not cut, only tear the cardboard, and leave a rough edge, and make too large a hole in twisting round to allow of a second circle to be struck with the same centre. I may explain that I cover



Cutting Cardboard Circles.

these circles of cardboard with velvet and place ornamental plates in the centre, which is cut out to the size of the back of the plate to be so mounted."—[I have found a very convenient method for cutting true circles in card as follows:—I have a board 36 by 30; it is the back of a large drawing-board, but kitchen table would do as well. I take my straw board, and drive a French round nail in centre on to board, and draw a piece of thin wire across as shown round a mount-cutter's knife blade, with keen edges sharpened upon oilstone. You can cut circle to any size you like, and with a little practice you will cut it as clean as the best machine, and with care your centre hole should not be enlarged the slightest.]

An Easily-Made Fret Machine.—F. W. (*Bradford*) writes:—"In answer to C. J. D. (*Glasgow*) (see page 332, Vol. I.), I think the reason his machine will not work is that the connecting rod (or that part that joins the vertical rod to the crank pin) is too short. It should be not less than 1½ times the length of the stroke, and as much longer as the space will admit, the reason being a lessening of friction. If the connecting rod be long enough, it will not matter if the vertical rod is not quite over the centre of fly-wheel."

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II.—Questions Answered by Editor and Staff.

Small Printing Press.—H. J. (*Bexhill*).—If H. J. requires a small-sized press not to exceed 3¼ in. by 5½ in., we should recommend him to buy a No. 1 Model self-inking press, £3 10s., from the Model Printing Press Company, 96, Farringdon Street, E.C., who make several larger sizes at proportionate prices. The cost of fit-up for amateur printing depends entirely upon the quantity and variety of type required, and the class of work intended to be done. The above company will give an estimate. If H. J. contemplates attempting to print cuts or zinco blocks, we should advise him to buy a small "Albion" hand-press, second-hand (the smallest will print 12 in. by 10 in.), which will cost far less, for the size, than these "Croppers." He can also obtain type, galleys, chases, and frames, and cases, second-hand, from Esson's, Fetter Lane, or Morton's, City Road, who may also have presses for sale. A line to Mr. Hawkins, explaining your wants, addressed care of C. Morton, as above, would, we think, ensure your procuring exactly what you require: as being a thoroughly practical compositor and printer, possessing good taste in the selection of founts, his advice would be valuable. Mention this journal.—J. W. H.

Glass Pen.—W. D. P. (*Sheffield*) and S. J. H. (*Blackburn*).—I cannot now refer to the number in which the glass pen is mentioned. But the "Note" was jotted down about August or July last. The *Moniteur Industriel* is a weekly paper published in Brussels, and you can get it direct, or through Trübner, of Ludgate Hill, E.C.—J.

Pattern Making.—R. R. M. (*Newcastle-on-Tyne*).—"Pattern Making," by a Foreman Pattern Maker. published by Lockwood, Ludgate Hill, E.C.—J.

Fret Polishing.—Amateur (*North Kensington*).—I do not exactly know whether you want to be told anything beyond the filling, or whether you write for general information on polishing and finishing fretwork. While congratulating you on your success in the competitions you refer to, I may remind you not to attach too much importance to the fact that you have surpassed others, as I am afraid you are inclined to. It would be a pity were you to allow yourself to think that no improvement could be made on your present work, for I presume that your competitors were all youthful, and however meritorious your and their work might be, it would probably have been "nowhere" by the side of more advanced fret-cutters' specimens. Your having gained the prizes shows that you have ability which may be fostered, while your letter shows you have a good deal to learn. Perhaps this seems rather "straight" talk, and not quite so nice as a few complimentary remarks on your skill. It will, however, be more useful, and I do not hesitate to criticise your methods, as you are evidently one whom it is worth teaching. First of all, I do not like the method you adopt for getting the pattern off the wood. If you will use water, do not let it "soak" into the wood. The less you wet this the better. I prefer to remove the pattern by rubbing down with glass-paper, though it is more laborious. By doing this the grain of the wood is not raised. The cuts are left clean and sharp from the saw. I am sorry I cannot agree with your belief that the work is improved by rubbing down without a block, and I am afraid you would not get any one who is a judge of good fretwork to consider that the appearance is improved by such treatment. I don't wonder at your not liking the filling of beeswax and plaster of Paris, but you must remember that any filling is difficult to use after the fret is cut, for the stuff gets into corners and over the edges in a very troublesome manner. Undoubtedly the best results are got by part polishing the wood before fretting, and finishing it afterwards. I fancy you understand something about polishing, so I need only tell you to oil the wood before filling and not after. The nicest filling is fine whiting mixed with some colouring matter to suit the colour of the wood, and made into a paste with turps, oil, water, or polish according to circumstances, which can hardly be enlarged on just now, but which will be fully considered in articles on polishing. The grain may also be effectively stopped by going over the wood with spirit varnish or French polish thickened by the addition of shellac. The surface must, of course, be lightly rubbed down afterwards, and finished in the usual manner. I think if you will put these hints into practice, you will not only find that your work looks better, but that it is done with less trouble than by pursuing the course you have hitherto. Yes, there is no doubt that oak which is merely oiled looks very nice. Let us hear from you any time when practical advice will be of assistance to you, and persevere till you become an A 1 artist in fretwork.—D. A.

Clog Irons.—H. F. (*Chorley*).—Clog irons are sold wholesale by Sumner & Co., Staleybridge, near Manchester; Ellis & Sons, Broughton Road, Salford; and Josiah Grimshaw, Leeds. I cannot take upon myself to say which is the best and cheapest house to buy from, but you will find these firms reliable, and no doubt you will be able to form your own opinion as to the merits of the goods they supply. If you write to them you may as well tell them you got their names and addresses from Work.—D. A.

Case-hardening Iron.—Ajax (*Edinburgh*) asks for "a recipe for case-hardening iron as used by the *Times*." I really do not understand this question. What iron is referred to? and what has the *Times* got to do with it? Case-hardening cast iron, wrought iron, or steel, is done by heating and chilling the surface suddenly; there are many recipes. For iron, perhaps the best (and I am astonished to find it is so little known and used) is the Bower-Barff process. The iron, cast or wrought, is heated to redness, and then subjected to steam in an oven. When cool, the surface is found to be converted into the black (or magnetic) oxide of iron to the depth of about $\frac{1}{300}$ of an inch of extreme hardness—and is also rustless—that is incapable of being changed to the red oxide. Iron so treated, therefore, will stand the weather, without painting for ages; it even resists the weaker acids, and dilute solutions of the stronger ones; a file will not touch it, and it will even, if of a proper angle, cut glass like a diamond.—J. W. H.

Cylinder.—H. M. (*Hichambrook*).—Your cylinder will require ports $\frac{5}{8}$ in. wide, the steam ports $\frac{3}{16}$ in. long, exhaust port $\frac{3}{8}$ in. long, distance between ports $\frac{3}{16}$ in. You could form the steam-ways with brass pipe screwed into the piece where steam ports are cut, and the other end turned and soldered into cylinder (Fig. 1). Its disadvantages are too long in stroke. The ends screw on, and you would have a difficulty in getting piston rod central. The covers are generally recessed $\frac{1}{4}$ in. or more; you would waste that amount of steam at each

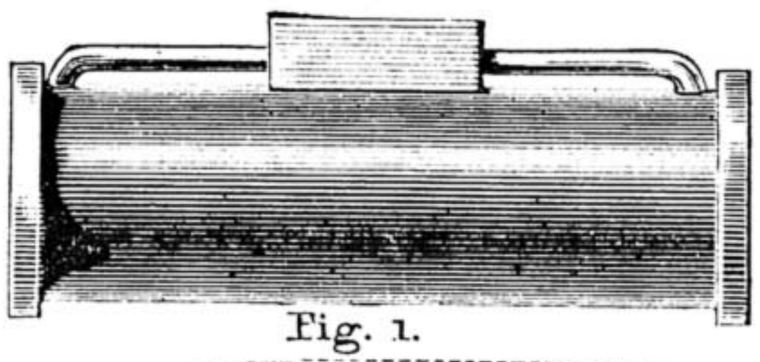

Fig. 1.

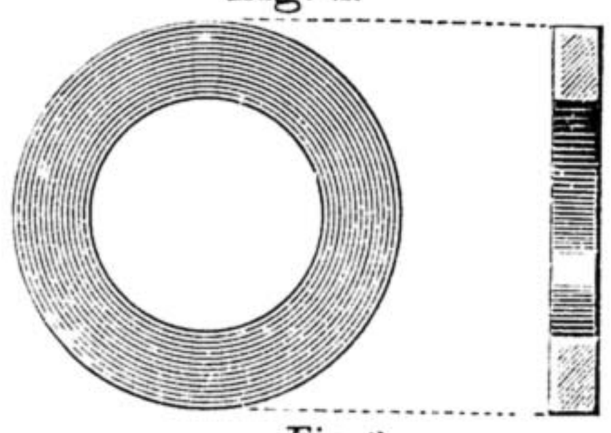

Fig 2.

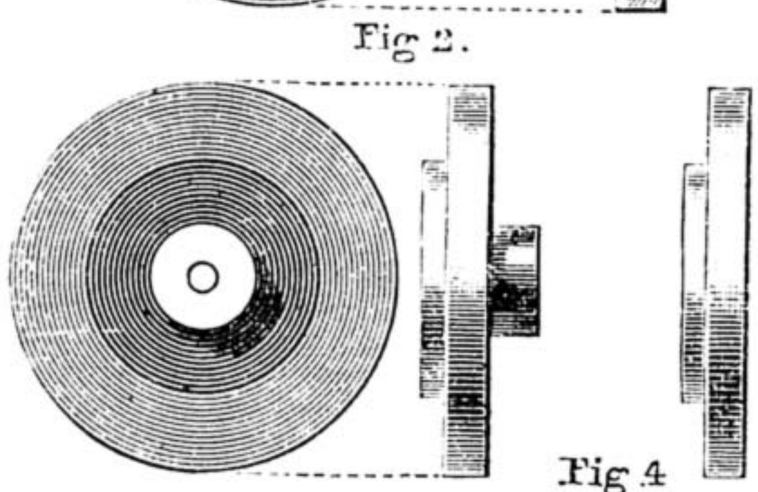

Fig. 3.

Fig 4

Parts of Cylinder.

end of the stroke, without you could fill up the recess. I would advise you to make the stroke 4 in., allowing for thickness of piston and steam-ways, and fix flanges on as described. They would be better made from castings, as they should be $\frac{1}{4}$ in. thick; (see Figs. 2, 3, and 4). If you turn your own patterns they won't cost much. It would drive a sewing machine or a 3-in. lathe, for iron turning, but not for wood turning, and would require a boiler 2 ft. long and 1 ft. diameter.—E.

Boring in Glass.—H. A. (*Bow*).—You will be able to get a ¾-in. hole bored in a piece of glass by almost any glass beveller. Any shop fitter would get it done for you. You must make your own arrangement about price. No respectable man will overcharge you. In case you do not know any one in the glass line you might ask Mr. Andrew Gibson, Garden Walk, Great Eastern Street, E.C., if he will bore the hole for you.—D. A.

V.—Brief Acknowledgments.

Questions have been received from the following correspondents, and answers only await space in Shop, upon which there is great pressure:—J. D. (*Glossop*); Apprentice; H. C. T. (*Holloway*); G. W. (*Swadland*); Black Stone; Perplexed; G. V. (*London, S.W.*); Thomaso; F. T. (*London, N.*); W. M. (*London, N.*); Centumgraph; W. N. L. (*Birmingham*); F. J. A. (*London, N.*); A Constant Reader; Anxious; T. D. G. (*Highgate*); A. S. (*London, W.*); Amateur Organ Builder; W. H. H. (*Huddersfield*); Musical; S. R. G. (*Liverpool*); A. T. E. (*Norwich*); H. G. (*Bishop-gate*); J. G. (*Birmingham*); F. N. (*Smethwick*); Wheelwright (*St. Day*); Stove Maker (*St. Day*); S. H. D. (*Newtown*); A. B. C. (*Birmingham*); T. T. (*Kilburn*); Apprentice; G. T. (*Chatham*); R. S. T. (*Leeds*); C W. (*Devon*); Amateur; T. J. (*Dudley*); E. G. (*Leyton*); E. G. H. (*Minehead*); G. T. (*Tewkesbury*); Fog Signal; G. L. (*Sheffield*); W. G. (*Cardiff*); S. J. (*Compstall*); R. M. (*Sheffield*); Markam; A. J. T. (*Holborn*); S. W. (*Camberwell, S.E.*); Electric; S. T. (*Newcastle-on-Tyne*); Canoe Builder (*London, N.W.*); Mit (*Rochester*); C. C. (*Darlington*); Solway; W. H. R. (*London, W.*); F B. (*London, W.*); J. J. (*Carlisle*); Chair; Tommy Tod; W. H. (*Bury*); Silicine; A Subscriber from the First; T. F. (*Preston*); J. G. K. (*Manchester*); Orthopædist, Inventor.

Trade Note.

Andrew Carnegie, it is said, will furnish the money to rebuild the public library destroyed by the flood at Johnstown, Pa. This is a very commendable act on his part, since there are no claims on him for doing it. It must be a satisfaction to a man of Mr. Carnegie's means to unload some of it where he can see it do good while he is living. His heirs will not quarrel over the money that goes to rebuild that library, and it will go right on doing good after he is dead. If men would consider the example of the late Peter Cooper, who was one of the happiest men in New York, there would be more public libraries built from overflowing pockets and fewer from the bequests of wills.—*American Machinist.*

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Splendid D Concert Flute for disposal; cork joints, screw head, tuning slide, 8 G. S. pillar keys; very handsome and imposing instrument. Only 16s. 6d., exceptional bargain, and cannot fail to please.—Debois, 34, Hill Street, Ipswich. [1 S

Electro Motors for driving lathes or light machinery. Price 40s. Photos on application.—1, York Villas, Hargrave Park Road, N. [2 S

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Model Work. Castings, models, etc. Illustrated list, 4d.—Stiffin & Co., 324, Essex Road, London, N. [4 S

Wooden Fly Wheel.—Sale or exchange, suitable for driving lathe by hand-power. Cheap.—F. Sutton, Hairdresser, Dorchester. [5 S

Materials for Violin Making from Briggs and Take, Violin, Violoncello, and Double Bass Makers, Commercial Street, Leeds. [28 R

Sideboard, with drawers and cupboard (August, 1889), partly made in walnut, with timber sufficient to complete. The walnut cost £5, and is of the very best quality and thoroughly seasoned. What offers?—J. G., 43, Greek Street, Soho, W. [6 S

The "Postable" Floral Tripod (see Work, Jan. 25th), post free, 1s. 6d.; pair, 2s. 9d. Bamboos supplied.—S. J. Eaton & Co., 3, New Inn Yard, Tottenham Court Road, W. [7 S

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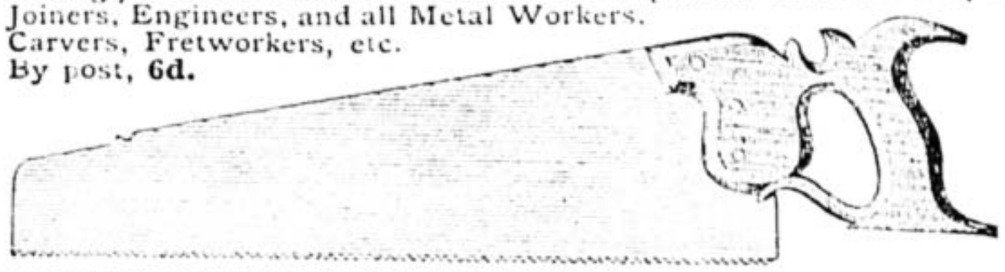

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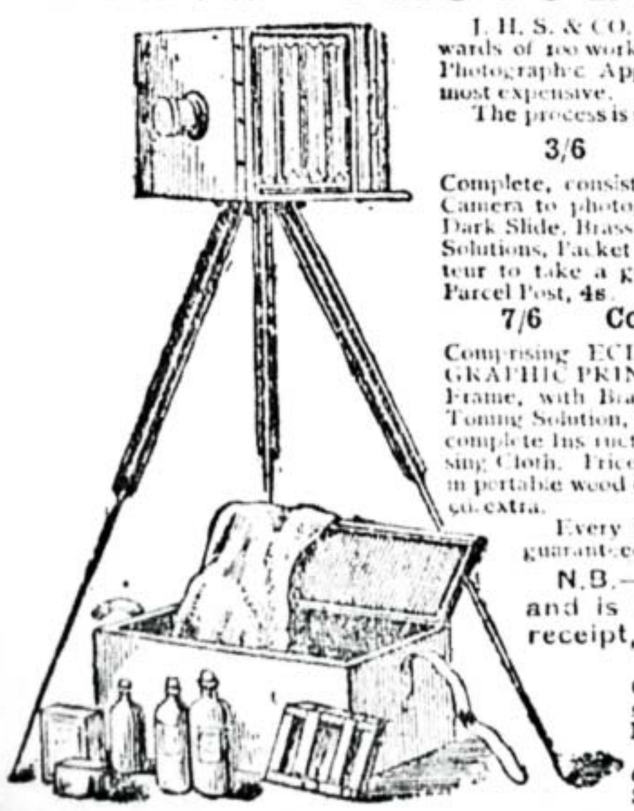

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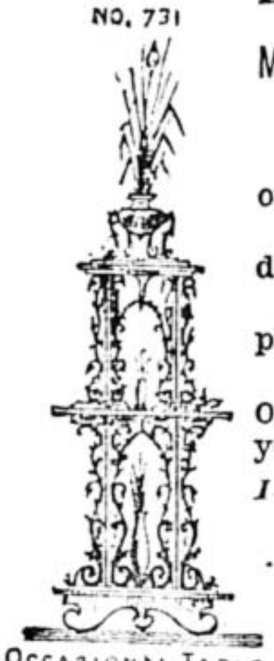

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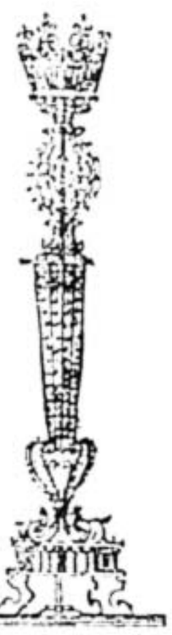

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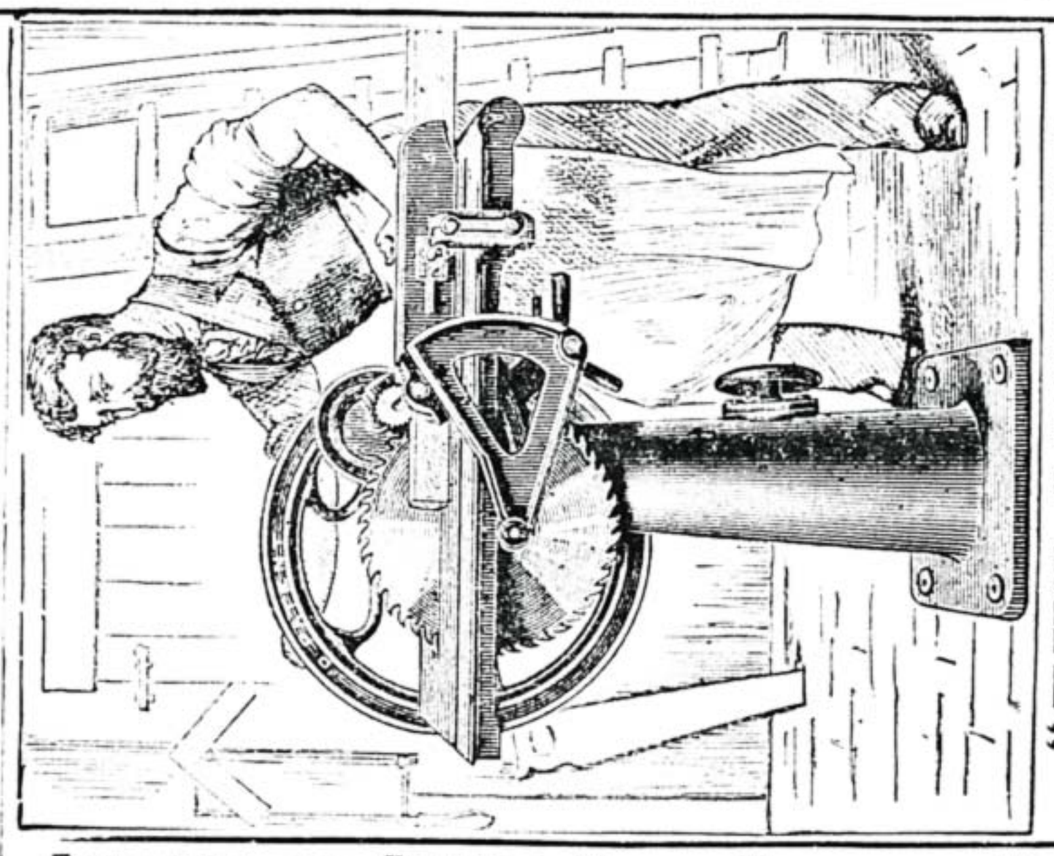

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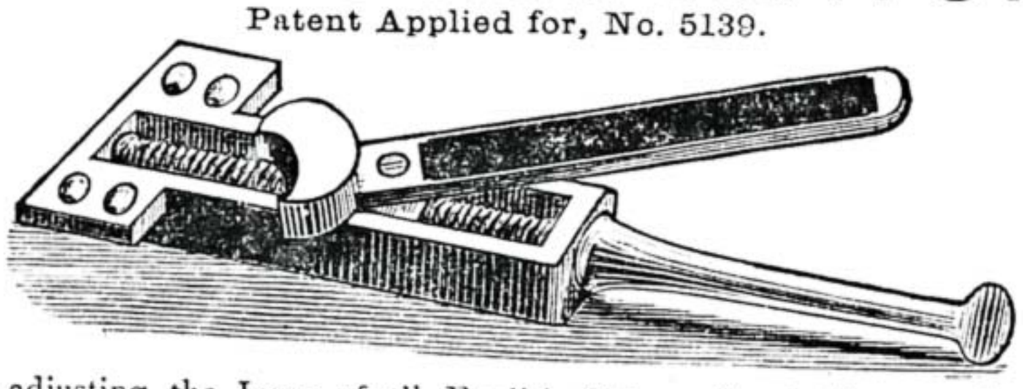

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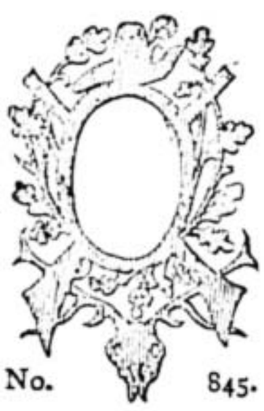

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